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HALOGEN OCCULTATION EXPERIMENT (HALOE) PERFORMANCE VERIFICATION TEST PROCEDURE

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EXPERIMENT (HALOE) PERFORMANCE VERIFICATION
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PREFACE

The procedure given in this report is used to comprehensively test most performance aspects of the HALOE instrument. Parts of this procedure were developed from individual procedures prepared during the initial characterization and performance test program, which was recently completed. A modular approach was used to allow a single procedure to be used over and over for many different types of test setups. With the proper instrument initialization sequence in Paragraph 4, any of the individual tests given in Paragraphs 5-16 can be performed individually or in a sequence selected by the user. This approach minimizes procedure preparation time and standardizes testing techniques so that trend data can be generated. E. E. Burcher will always serve as Test Conductor, which will provide the necessary continuity to efficiently resolve test related problems and anomalies. The author would like to especially thank Mr. Burcher and all other members of the HALOE test team for their contributions to this effort. Although this procedure, which corresponds to the HALOE Project Office Controlled Document HALOE-09-159, may not be specifically applicable, it should provide future in-house flight test programs with helpful, general guidelines in preparation of similar documents.

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PERFORMANCE VERIFICATION TEST PROCEDURE

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PERFORMANCE VERIFICATION TEST PROCEDURE

1.0 SCOPE

1.1 Equipment to be Tested

The configuration of the HALOE instrument for systems level testing is given in Appendix 1. During systems testing, all changes to this configuration must be recorded in the empty space below by the Test Conductor or Quality Representative.

1.2 Test Objective

This document provides the detailed procedures for HALOE systems level testing. Systems level testing has been divided into three types:

Level I - Used for complete system level checkout. Requires rate table and 90° mounting bracket.

Level II - Used where the primary goal is to simulate orbital modes of operation and verify the tracker/telescope boresight alignment. Requires rate table and 90° mounting bracket.

Level III - Used where primary goal is a quick check of instrument health to verify no gross failure has occurred.

These tests will be run several times during the HALOE environmental test program to verify instrument integrity before, during, and after environmental exposure. Moreover, they will also be used to verify instrument health after it has been moved between test facilities.

Actually, more than three variations of testing will occur. Test setup constraints (radiation source, rate table, gimbal cage) will dictate how the procedure is performed. Therefore, the procedure is written to provide adequate flexibility to cover all test conditions. The alternate paragraphs for Initialization and Orbital Sequence Test are written to address specific test setup constraints.

1.3 Test Sequence

The test sequence performed shall be determined prior to performing the test. The Test Conductor will decide during the Test Readiness Review, which is held immediately prior to the test, which paragraphs given below are to be run and initial to indicate.

Performance Verification Test Level ________________

Title of Test ______________________________________

Para.	Test	Test Conductor
3.0	Power On/Off	____________
4A.0	Initialization A	____________
4B.0	Initialization B	____________
4C.0	Initialization C	____________
4D.0	Initialization D	____________
5.0	Command/Mode	____________
6A.0	Orbital Sequence A	____________
6B.0	Orbital Sequence B	____________
6C.0	Orbital Sequence C	____________
6D.0	Orbital Sequence D	____________
7.0	Sun Sensor Boresight, El	____________
8.0	IFOV, Elevation	____________
9.0	Gimbal Range	____________
10.0	Linearity	____________
11.0	Sun Sensor Boresight, Az	____________
12.0	IFOV, Azimuth	____________
13.0	Cal Wheel A (1 min dwell)	____________
14.0	Cal Wheel B (7.5 sec dwell)	____________
15.0	Solar Heating/Self Thermal Emission	____________
16.0	Health Check	____________

2.0 TEST CONDITIONS

2.1 Personnel

The following personnel shall conduct and/or monitor these tests and analyze test results.

Test Conductor ____________________

Quality Representative ____________________

Software Engineer ____________________

Electronic Engineer ____________________

Radiometric Engineer ____________________

Pointer/Tracker Engineer ____________________

2.2 Test Equipment

The test equipment will vary depending on the level of testing and test setup constraints. Check the test equipment (by Test Conductor initials) that is appropriate for the particular test being run. The equipment needs for a particular test are determined at the Test Readiness Review.

2.2.1 3000°K GSE blackbody ________________

2.2.2 Collimating Optics ________________

2.2.3 Portable Stimulus Test Set ________________

2.2.4 UVY Tungsten Source ________________

2.2.5 Rate Table ________________

2.2.6 IETS ________________

2.2.7 GCETS ________________

2.2.8 GCETS Data System ________________

2.2.9 Si. Std. Radiometer ________________

2.2.10 Knife-Edge Apparatus ________________

2.2.11 Slit Apparatus ________________

2.2.12 Gloves ________________

2.2.13 Handling Fixture ________________

2.2.14 Electrostatic Discharge Strap ________________

2.2.15 90° Rate Table Bracket ________________

2.2.16 AMO Solar Simulator ____________________

2.2.17 Cold Plate Apparatus ____________________

2.3 Test Setup

The instrument/IETS setup is shown in Figure 2.3-1. The normal radiometric setup is shown in Figure 2.3-2. For some Level I tests, the instrument must be turned to place the rate table in the azimuth axis. This is shown in Figure 2.3-3.

2.4 Test Preparations

2.4.1 Check to be sure instrument is mounted to the rate table for elevation axis rotation.

2.4.2 Before any connectors are connected to HALOE, a pin-to-pin check must be made with the cables connected to IETS connectors to verify all inputs (voltages, etc.) are correct. Procedure HALOE-03-162, Rev. A., is to be used for this check.

2.4.3 Provide all electrical connections to the instrument, IETS, and GCETS per Test Cabling Drawing #818989.

2.4.4 Provide cooling water and argon gas connections to blackbody.

2.4.5 Determine the cage status of the gimbals and contamination door, and then set to the required status.

2.4.6 Insure that either rotation of the rate table or instrument gimbals on the rate table does not cause stresses on cables and connectors and does not cause the instrument or mounting fixture to strike any object.

2.4.7 Provide IETS initialization per the power-up procedure given in Para. 2.6.17.

2.4.8 Provide the GSE blackbody initialization per the power-up procedure given in Para. 2.6.18 if the 3000°K source is used or Para. 2.6.19 if the Portable Stimulus Test Set is used.

2.4.9 Initialize UWY source and check for lamp alignment per procedures given in Para. 2.6.20.

2.4.10 Align radiometric setup.

2.4.10.1 Provide alignment such that the rate table rotates instrument in elevation axis and telescope and Sun sensor are placed in the center of the beam.

2.4.10.2 Align the GSE blackbody source and UWY source to instrument to within ± 1/2 degree (Az and E).

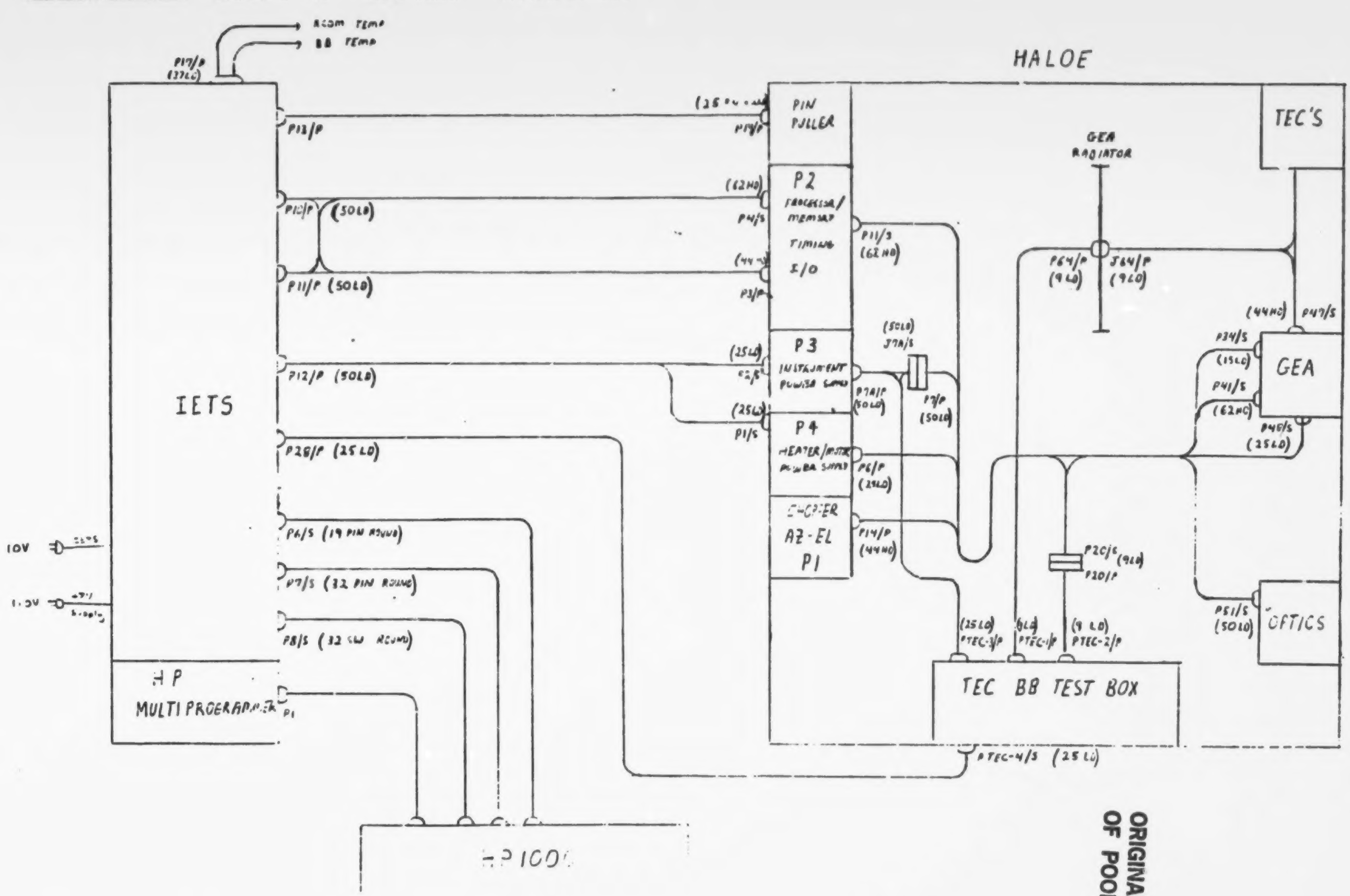

Figure 2.3-1 HALOE Electronics Connections

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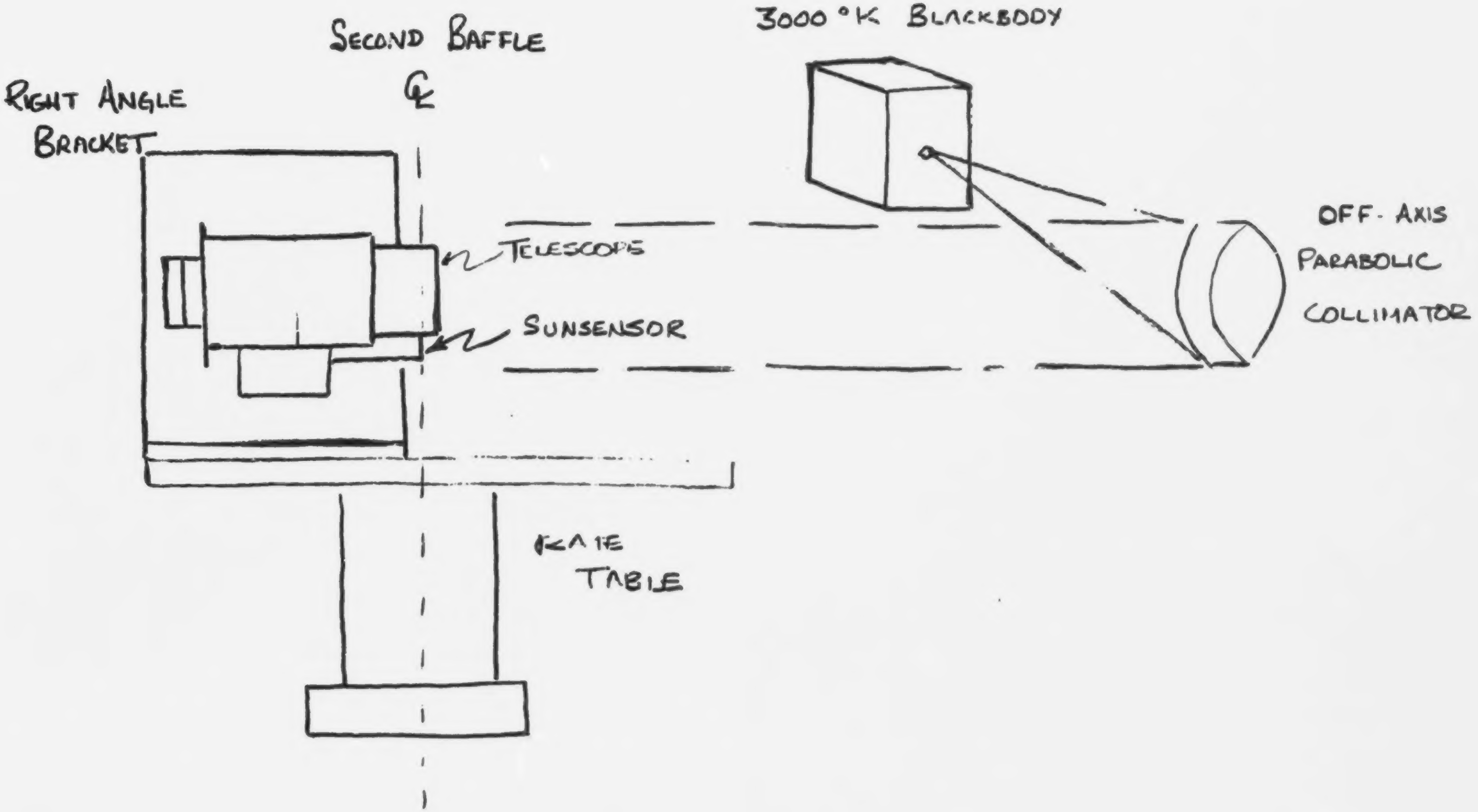

FIGURE 2.3-2 Test Setup for Elevation-Axis Testing

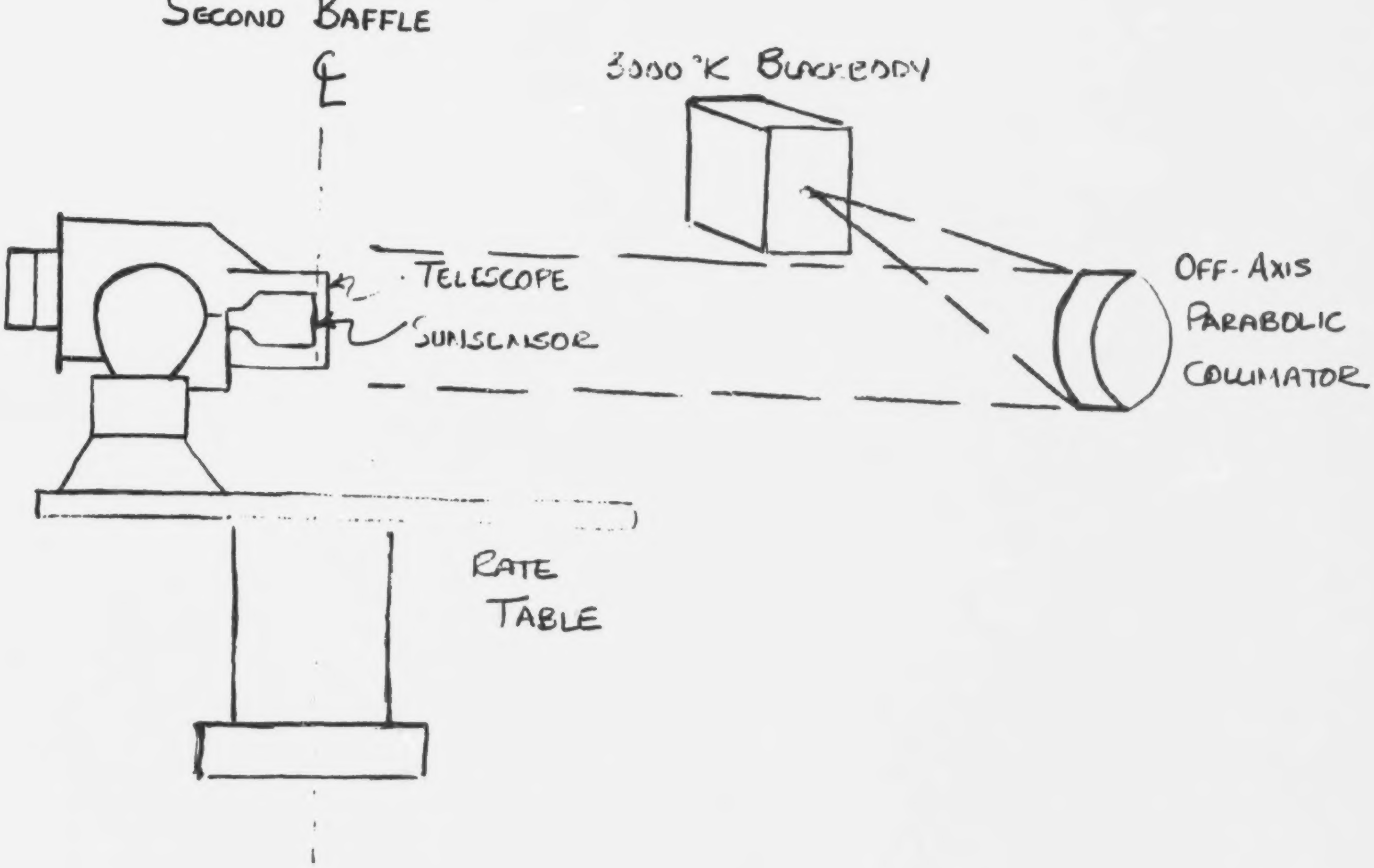

FIGURE 2.3-3 Test Setup for Azimuth-Axis Testing

2.4.10.3 Align Si. Std. radiometer to blackbody source (for Linearity Test only).

2.4.11 Attach cold plate to instrument radiator and insure coolant flow to cold plate before powering up instrument. Regulate temperature to 21°C ± 1.

2.5 Special Hazards and Precautions

2.5.1 This test shall be conducted in a class 100 clean room if the instrument is fully exposed. Otherwise, it must be bagged and purged at all times.

2.5.2 Use extreme care when instrument is mounted to the 90° bracket not to command it or manually turn the azimuth gimbal to angles that cause the instrument to strike the bracket or other apparatus.

2.5.3 Before any handling (moving, etc.) of the instrument, insure that the gimbals and contamination door are caged.

2.5.4 Install the handling fixture for all handling, and follow the procedures given in the handling procedure.

2.5.5 Do not look into radiation sources or touch their hot surfaces.

2.5.6 Do not handle instrument without gloves.

2.5.7 An approved electrostatic discharge strap must be used when mating/demating connectors.

2.5.8 All tests requiring a nitrogen purge shall be monitored with oxygen monitor safety equipment which will sound an alarm if the room oxygen level falls below safe levels.

2.5.9 This procedure is written as an uninterrupted sequence. When power is turned off for overnight shutdown or for any other interruption, the procedure given in Paragraphs 3.12 - 3.19 must be used. Then, the procedure given in Paragraphs 3.3 - 3.11 must be used for the following power-on. All test conditions, then, must be returned to the pre-shutdown status before continuing the test.

2.6 Applicable Documents

2.6.1 Integrated Test Plan
HALOE-09-034A

2.6.2 Test Requirements Document
HALOE-13-054A

2.6.3 Product Assurance Plan
HALOE-11-001C

2.6.4 Hardware Cleaning and Contamination Control Procedure
HALOE-13-005B

2.6.5 Contamination/Cleanliness Control Plan
HALOE-13-003B

2.6.6 GCETS Operating Instructions
HALOE-09-103

2.6.7 IETS Operating Procedure

2.6.8 3000°K Blackbody Operating Procedure

2.6.9 PSTS Operating Procedure

2.6.10 UWY Source Operating Procedure

2.6.11 Rate Table Operating Procedure

2.6.12 Gimbal Angular Calibration Table

2.6.13 Test Cabling Drawing #818989

2.6.14 HALOE/IETS Interface Pre-Hookup Checklist
HALOE-03-162

2.6.15 All Shop Travelers and Schematics

2.6.16 Configuration Identification (Appendix 1)

2.6.17 IETS Power Up/Down Procedure

2.6.18 3000°K Blackbody Operating Procedure

2.6.19 Portable Stimulus Test Set Operating Procedure

2.6.20 UWY Radiometric Source Operating Procedure

2.6.21 Conversion Azimuth Gimbal Angles - Hexidecimal to Degrees (Table 1)

2.6.22 Conversion of Coarse Sun Sensor Magnitude (CSSMAG) - Hexidecimal to Voltage (Table 2)

2.6.23 AMO Solar Simulator Operations Manual

2.7 Limit Checking

Limits shall be set for all instrument health telemetry channels. Parameters which exceed limits are displayed on the IETS screen. When hard (red) limits are exceeded, the IETS performs an automatic power down of the instrument. When these test aborts occur, the Test Conductor will notify the key personnel listed in Para. 2.1 and the Test Manager. The Test Manager will define the appropriate action to be taken before restarting the test. When soft (yellow) limits are exceeded, the Test Conductor will notify the key personnel listed in Para. 2.1. The test must stop until the anomaly is resolved, but the instrument does not have to be powered off. A test anomaly sheet shall be used by the Test Conductor to document each test anomaly and action taken when limits are exceeded.

2.8 Retest Requirements

Test data shall be reviewed by appropriate personnel and instrument performance shall be compared to the Initial Performance Verification Baseline Test and to specification, if applicable. if nonconformances are identified they shall be reported on a Nonconformance Report, Form 143, and submitted for appropriate disposition. If test anomalies occur, such as deviations from the baseline data for parameters that do not have a specification, then the Test Manager (and Science Representative if the parameter is science related) must be notified. The Test Manager must determine the appropriate action before proceeding with the test.

2.9 Tape Log

Record the date, tape number, and beginning paragraph number for each tape used for this test.

Tape No.	Date	Beginning Para. No.

3.0 POWER ON/OFF

This procedure shall be used for each instrument power-on and power-off during the test.

ON PROCEDURE

3.1 All preparations given in Paragraph 2.4 have been completed and precautions given in Paragraph 2.5 have been read.

Date	Test Conductor	R&QA
________	________	________

3.2 Annotate IETS tape header with tape number, date, title of this test, and Test Conductor.

____

3.3 Annotate IETS tape "Power On."

____

3.4 Set switches on IETS front panel.

I+Pri switch.................(monentary) ON ________

I+H/M switch................(up) ON ________

3.5 Send the H/M Power-On command from the IETS.

____

3.6 Verify the 7.0v Standby light goes off.

____

3.7 Verify the following IETS power supply parameters are within limits.

Pri	28 V	: 28 ± 1 V	________
H/M	28 V	: 28 ± 1 V	________
	3.5 V	: 6 ± 0.2 V	________
	7.0 V	: 8 ± 0.2 V	________
	12 V	: 15 ± 0.2 V	________
Pri	28 I	: 0.9 ± 0.2 A	________
H/M	28 I	: 0.4 ± 0.2 A	________

3.8 Allow a minimum of 30 min. warmup, and run TELAL program at 5 min. intervals during warmup period.

____

3.9 After warmup period verify the following telemetry is within limits.

3.9.1 HCLVDT = 1.0 - 1.1 V ___________

HCLGDT = 1.0 - 1.1 V ___________

HFVDT = 1.0 - 1.1 V ___________

HFGDT = 1.0 - 1.1 V ___________

CH4VDT = 1.0 - 1.1 V ___________

CH4GDT = 1.0 - 1.1 V ___________

NOVDT = 2.0 - 2.1 V ___________

NOGDT = 2.0 - 2.1 V ___________

BBR = 4.03 - 4.06 V ___________

3.10 Annotate IETS tape "End of Power On Test."

____

3.11 Power-up is complete.

_______________	_______________	_______________
Date	Test Conductor	R&QA

OFF PROCEDURE

3.12 Annotate IETS tape "Power Off."

____

3.13 Send the H/M Power-Off command from the IETS, and set the I+H/M switch on the IETS/Instrument Power Supply panel to the OFF (center) position.

____

3.14 Verify that the H/M Power Supply current drops to zero.

____

3.15 Press the I+Pri switch on the IETS/Instrument Power Supply panel to (momentary) OFF and release.

____

3.16 Verify that the 7.0v standby light on the TEC-BB junction box in the clean room is ON.

____

3.17 Verify that the Primary 28v, 3.5v and the 12v Power Supply currents drop to zero.

____

3.18 Execute the IETS Power-Off Procedure, per Para. 2.6.7.

____

3.19 Power-off is complete.

Date	Test Conductor	R&QA

4A.0 INITIALIZATION WITH TWO SOURCES AND RATE TABLE

This procedure is used to initialize the instrument and rate table to match specific test setup conditions. It will be used ONLY when the test setup employs the RATE TABLE and TWO sources. Use Para. 4B.0, 4C.0, or 4D.0 for other test setup conditions. This procedure will be used for all Level I testing.

4A.1 Identify blackbody source.

____

4A.2 Verify the following:

4A.2.1 UWY source is in setup __________.

4A.2.2 Sun sensor does not have neutral denstiy filter installed __________.

4A.2.3 Rate table is in setup __________.

4A.2.4 Instrument is mounted to 90° bracket so that rate table rotates elevation axis with the Sun sensor and telescope in the center of the collimated beam.

____

4A.2.5 Test setup preparation per Para. 2.4 is complete.

____

4A.2.6 Instrument power-on per Para. 3.0 is complete.

____

4A.2.7 AGC switch is set to "On" if GCETS is in test setup.

____

4A.3 Annotate IETS tape "Begin Initialization A, Para. 4A.3."

____

4A.4 Record rate table position.

________________ deg

4A.5 Determine AZIM, ELEV, and rate table values to align instrument to blackbody source.

4A.5.1 Manually and/or electrically rotate azimuth gimbal elevation gimbals and rate table until HALOE Sun sensor and telescope are centered in beam and aligned to the blackbody source within acquisition field-of-view (± 1/2°).

____

4A.5.2 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null ± 0.1 V.

____

4A.5.3 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4A.5.4 Record SUNSET AZIM ________ H ________ deg

ELEV ________ H ________ deg

Rate Table Position ________ deg

CSS MAG ________ H ________ V

4A.5.5 Send command 0800H followed by command 0000H.

____

4A.6 Determine AZIM and ELEV values to align instrument to UWY source.

4A.6.1 Set UWY source intensity to 70% ______________

4A.6.2 Manually and/or electrically rotate azimuth gimbal, elevation gimbal, and rate table until HALOE Sun sensor is centered in the beam and aligned to UWY source within the acquisition field-of-view (± 1/2°).

____

4A.6.3 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null ± 0.1 V.

____

4A.6.4 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4A.6.5 Record SUNSET AZIM ________ H ________ deg

ELEV ________ H ________ deg

Rate Table Position ________ deg

CSS MAG ________ H ________ V

4A.6.6 Send command 0800H followed by command 0000H.

____

4A.7 Determine azimuth positive and negative soft limits (elevation limits will be default values).

4A.7.1 Record AZIM from Para. 4A.5.4 and 4A.6.5.

Sunset AZIM ______________ deg

Sunrise AZIM ______________ deg

4A.7.2 Round the numbers above to the nearest degree.

Sunset AZIM ______________ deg

Sunrise AZIM ______________ deg

4A.7.3 Add 15° to the highest number and subtract 15° from lowest number to establish azimuth soft limits.

Positive ______________ deg

Negative ______________ deg

4A.7.4 Convert these values to hexidecimal using Table 1.

4A.7.4.1 Azimuth soft limit Positive ______________ H

4A.7.4.2 Azimuth soft limit Negative ______________ H

4A.7.5 The default values for elevation soft limits are given below.

4A.7.5.1 Elevation soft limit Positive 0146H (+10 deg).

4A.7.5.2 Elevation soft limit Negative 0EB9H (-27 deg).

4A.8 Determine initial position values for azimuth and elevation.

4A.8.1 Record AZIM and ELEV from Para. 4A.5.4 and 4A.6.5.

Blackbody source [4A.5.4] AZIM ________________ deg
(Sunset)
ELEV ________________ deg

UWY source [4A.6.5] AZIM ________________ deg
(Sunrise)
ELEV ________________ deg

4A.8.2 Round these values to nearest degree.

Blackbody source AZIM ________________ deg
(Sunset)
ELEV ________________ deg

UWY source AZIM ________________ deg
(Sunrise)
ELEV ________________ deg

4A.8.3 Add 1 degree to all values above.

Blackbody source AZIM ________________ deg
(Sunset)
ELEV ________________ deg

UWY source AZIM ________________ deg
(Sunrise)
ELEV ________________ deg

4A.8.4 Convert these values to hexidecimal to determine sunset and sunrise initial positions.

4A.8.4.1 Sunset initial position AZIM ______________ H

ELEV ______________ H

4A.8.4.2 Sunrise initial position AZIM ______________ H

ELEV ______________ H

4A.9 Determine day and night stow azimuth and elevation gimbal positions.

4A.9.1 Record the values from Para. 4A.7.2.

Sunset AZIM ________________ deg

Sunrise AZIM ________________ deg

4A.9.2 Add 10° to the largest value for day stow and subtract 10° from the smallest value for night stow.

Day stow AZIM _______________ deg

Night stow AZIM _______________ deg

4A.9.3 Convert these values to hexidecimal using Table 1.

4A.9.3.1 Day stow AZIM _______________ H

4A.9.3.2 Night stow AZIM _______________ H

4A.9.4 The elevation gimbal day stow will be set to +5° and the night stow will be set to -5° using the hexidecimal values recorded below.

4A.9.4.1 Day stow ELEV + 5 deg, 0317H

4A.9.4.2 Night stow ELEV - 5 deg, 06BAH

4A.10 Set sunrise and sunset "complete" elevation angles to the values given below.

4A.10.1 Record ELEV positions from Para. 4A.8.2.

Sunset ELEV _______________ deg

Sunrise ELEV _______________ deg

4A.10.2 Subtract 6° from sunset value and add 3° to sunrise value to determine "complete" elevation angles.

Sunset ELEV _______________ deg

Sunrise ELEV _______________ deg

4A.10.3 Convert these values to hexidecimal using Table 1.

Sunset Complete ELEV _______________ H

Sunrise Complete ELEV _______________ H

4A.11 Determine sunrise and sunset enable thresholds.

4A.11.1 Record CSSMAG from Para. 4A.5.4 and 4A.6.5.

[4A.5.4] Sunset __________ H __________ V

[4A.6.5] Sunrise __________ H __________ V

4A.11.2 Choose enable thresholds that are slightly greater than 1/2 of the values recorded above.

Sunset enable threshold ______________ V

Sunrise enable threshold ______________ V

4A.11.3 Convert the values above to hexidecimal using Table 1.

4A.11.3.1 Sunset enable threshold ______________ H

4A.11.3.2 Sunrise enable threshold ______________ H

4A.12 Delay Time Initialization.

The "delay time" for the sunset sequence will be set to 10 seconds by serial command 600AH.

____

4A.13 Rate Table Initialization

4A.13.1 Sunset position. Record value from Para. 4A.5.4.

Sunset __________ deg

4A.13.2 Add 2^{o}. This will be the initial rate table position for a sunset event.

Sunset Rate Table Initial Position __________ deg

4A.13.3 Sunrise position. The value recorded in Para. 4A.6.5 will be used as the initial rate table position for a sunrise event.

Sunrise Rate Table Initial Position __________ deg

4A.14 Fill in the table below for all initialization values.

INSTRUMENT INITIALIZATION VALUES - RATE TABLE WITH TWO SOURCES

Para.	Parameter	Value
4A.7.5.1	Soft limit pos - elevation	0146H
4A.7.5.2	Soft limit neg - elevation	0EB9H
4A.7.4.1	Soft limit pos - azimuth	____H
4A.7.4.2	Soft limit neg - azimuth	____H
4A.8.4.1	Sunset initial position - elevation	____H
4A.8.4.1	Sunset initial position - azimuth	2___H
4A.8.4.2	Sunrise initial position - elevation	____H
4A.8.4.2	Sunrise initial position - azimuth	1____H
4A.9.4.1	Day stow position - elevation	D317H
4A.9.3.1	Day stow position - azimuth	3___H
4A.9.4.2	Night stow position - elevation	E6BAH
4A.9.3.2	Night stow position - azimuth	4___H
4A.10.3	Sunset complete - elevation	____H
4A.10.3	Sunrise complete - elevation	____H
4A.11.3.1	Sunset enable threshold	C___H
4A.11.3.2	Sunrise enable threshold	B___H
4A.12	Delay time	600AH

RATE TABLE INITIALIZATION VALUES

Para.	Parameter	Value
4A.13.2	Sunset automatic sequence	______ deg
4A.13.3	Sunrise automatic sequence	______ deg

4A.15 Use the command editor to review the current values in the NEWGM command file. Update this command file to the values recorded in Para. 4A.14.

____

4A.16 Send and dump command file NEWGM.

____

4A.17 Dump IETS "Sun" screen entitled "Initialization A, Para. 4A.17."

____

4A.18 Annotate IETS tape "End of Initialization A, Para. 4A.18."

____

4A.19 Instrument Initialization is complete.

________________	________________	________________
Date	Test Conductor	R&QA

CAUTION: The NEWGM command file must be sent each time the sunset/sunrise sequence in Para. 6A is performed. The initial position values for azimuth and elevation for both sunset and sunrise are automatically updated when gimbals complete acquisition, which forces a reinitialization to perform another sequence.

4B.0 INITIALIZATION WITH ONE SOURCE AND RATE TABLE

This procedure is used to initialize the instrument and rate table to match specific test setup conditions. It will be used ONLY when the test setup employs the RATE TABLE and ONE blackbody source. It must be used for SUNRISE and SUNSET tests when the fine Sun sensor has its neutral density filter installed. Use Para. 4A.0, 4C.0, or 4D.0 for other test setup conditions.

4B.1 Identify blackbody source.

____

4B.2 Verify the following:

4B.2.1 Rate table is in setup.

____

4B.2.2 Instrument is mounted to 90° bracket so that rate table rotates elevation axis with the Sun sensor and telescope in the center of the collimated beam.

____

4B.2.3 Test setup preparation per Para. 2.4 is complete.

____

4B.2.4 Instrument power-on per Para. 3.0 is complete.

____

4B.2.5 AGC switch is set to "On" if GCETS is in test setup.

____

4B.3 Annotate IETS tape "Begin Initialization B, Para. 4B.3."

____

4B.4 Record rate table position.

____

4B.5 Determine AZIM, ELEV, and rate table values to align instrument to blackbody source.

4B.5.1 Manually and/or electrically rotate azimuth and elevation gimbals and rate table until HALOE Sun sensor and telescope are centered in beam and aligned to the blackbody source within acquisition field-of-view (± 1/2°).

____

4B.5.2 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null ± 0.1 V.

____

4B.5.3 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4B.5.4 Record SUNSET/SUNRISE AZIM _________ H _________ deg

ELEV _________ H _________ deg

Rate Table Position _________ deg

CSS MAG _________ H _________ V

4B.5.5 Send command 0800H followed by command 0000H.

____

4B.6 Determine azimuth positive and negative soft limits (elevation limits will be default values).

4B.6.1 Record AZIM from Para. 4B.5.4.

[4B.5.4] AZIM _______________ deg

4B.6.2 Round the number above to the nearest degree.

AZIM _______________ deg

4B.6.3 Add and subtract 15° to establish azimuth soft limits.

Positive _______________ deg

Negative _______________ deg

4B.6.4 Convert these values to hexidecimal using Table 1.

4B.6.4.1 Azimuth soft limit Positive _______________ H

4B.6.4.2 Azimuth soft limit Negative _______________ H

4B.6.5 The default values for elevation soft limits are given below.

4B.6.5.1 Elevation soft limit Positive 0146H (+10 deg).

4B.6.6.2 Elevation soft limit Negative 0EB9H (-27 deg).

4B.7 Determine initial position values for azimuth and elevation.

4B.7.1 Record AZIM and ELEV from Para. 4B.5.4.

AZIM _______________ deg

ELEV _______________ deg

4B.7.2 Round these values to nearest degree.

AZIM _______________ deg

ELEV _______________ deg

4B.7.3 Add 1 degree to the values above.

AZIM _______________ deg

ELEV _______________ deg

4B.7.4 Convert these values to hexidecimal to determine sunset and sunrise initial positions.

Sunset & sunrise initial position AZIM _____________ H

ELEV _____________ H

4B.8 Determine day and night stow azimuth and elevation gimbal positions.

4B.8.1 Record the value from Para. 4B.6.2.

AZIM _______________ deg

4B.8.2 Add 10° for day stow and subtract 10° for night stow.

Day stow AZIM _______________ deg

Night stow AZIM _______________ deg

4B.8.3 Convert these values to hexidecimal using Table 1.

4B.8.3.1 Day stow AZIM _______________ H

4B.8.3.2 Night stow AZIM _______________ H

4B.8.4 The elevation gimbal day stow will be set to +5° and the night stow will be set to -5° using the hexidecimal values recorded below.

4B.8.4.1 Day stow ELEV + 5 deg, 0317H

4B.8.4.2 Night stow ELEV - 5 deg, 06BAH

4B.9 Set sunrise and sunset "complete" elevation angles to the values given below.

4B.9.1 Record ELEV position from Para. 4B.7.2.

ELEV _______________ deg

4B.9.2 Subtract 6° from value above to determine sunset complete elevation angle.

Sunset Complete Elevation __________ deg

4B.9.3 Add 3° to value in 4B.9.1 to determine sunrise complete elevation angle.

Sunrise Complete Elevation __________ deg

4B.9.4 Convert these values to hexidecimal.

Sunset Complete Elevation __________ H

Sunrise Complete Elevation __________ H

4B.10 Determine sunrise and sunset enable thresholds.

4B.10.1 Record CSSMAG from Para. 4B.5.4.

CSSMAG _______________ H

4B.10.2 Choose enable thresholds that are slightly greater than 1/2 of the values recorded above.

Sunset enable threshold _______________ V

Sunrise enable threshold _______________ V

4B.10.3 Convert the values above to hexidecimal using Table 1.

4B.10.3.1 Sunset enable threshold _______________ H

4B.10.3.2 Sunrise enable threshold _______________ H

4B.11 Delay Time Initialization.

The "delay time" for the sunset sequence will be set to 10 seconds by serial command 600AH.

____

4B.12 Rate Table Initialization

4B.12.1 Record value from Para. 4B.5.4. This will be the SUNRISE value.

____

4B.12.2 Addd 2 degrees. This will be the SUNSET value.

____

4B.13 Fill in the table below for all initialization values.

INSTRUMENT INITIALIZATION VALUES - RATE TABLE WITH ONE SOURCE

Para.	Parameter	Value
4B.6.5.1	Soft limit pos - elevation	0146H
4B.6.5.2	Soft limit neg - elevation	0EB9H
4B.6.4.1	Soft limit pos - azimuth	____H
4B.6.4.2	Soft limit neg - azimuth	____H
4B.7.4	Sunset initial position - elevation	____H
4B.7.4	Sunset initial position - azimuth	2___H
4B.7.4	Sunrise initial position - elevation	____H
4B.7.4	Sunrise initial position - azimuth	1___H
4B.8.4.1	Day stow position - elevation	D317H
4B.8.3.1	Day stow position - azimuth	3___H
4B.8.4.2	Night stow position - elevation	E6BAH
4B.8.3.2	Night stow position - azimuth	4___H
4B.9.4	Sunset complete - elevation	____H
4B.9.4	Sunrise complete - elevation	____H
4B.10.3.1	Sunset enable threshold	C___H
4B.10.3.2	Sunrise enable threshold	B___H
4B.11	Delay time	600AH

RATE TABLE INITIALIZATION VALUES

Para.	Parameter	Value
4B.12.1	Sunrise automatic sequence	______ deg
4B.12.2	Sunset automatic sequence	______ deg

4C.0 INITIALIZATION WITH TWO SOURCES AND NO RATE TABLE

This procedure is used to initialize the instrument to match specific test setup conditions when the test setup employs TWO sources but NO rate table. Use Para. 4A.0, 4B.0, or 4D.0 for other test setup conditions. This sequence will be used for the Thermal/Vacuum Test.

4C.1 Identify blackbody source.

____

4C.2 Verify the following:

4C.2.1 UWY source is in setup __________.

4C.2.2 Sun sensor does not have neutral density filter installed __________.

4C.2.3 Instrument is mounted vertically and can turn freely in azimuth to view both radiometric sources.

____

4C.2.4 Test setup preparation per Para. 2.4 is complete.

____

4C.2.5 Instrument power-on per Para. 3.0 is complete.

____

4C.2.6 AGC switch is set to "On" if GCETS is in test setup.

____

4C.3 Annotate IETS tape "Begin Initialization C, Para. 4C.3."

____

4C.4 Determine AZIM and ELEV values to align instrument to blackbody source.

4C.4.1 Manually and/or electrically rotate azimuth and elevation gimbals until HALOE Sun sensor and telescope are centered in beam and aligned to the blackbody source within acquisition field-of-view ($\pm 1/2^{\circ}$).

____

4C.4.2 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null within 0.1 volt.

____

4C.4.3 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4C.4.4 Dump IETS screen entitled with paragraph number and record the following values.

SUNSET AZIM __________ H __________ deg

ELEV __________ H __________ deg

CSS MAG __________ H __________ V

4C.4.5 Send command 0800H followed by command 0000H.

____

4C.5 Determine AZIM and ELEV values to align instrument to UWY source.

4C.5.1 Set UWY source intensity to 70% ________________

4C.5.2 Manually and/or electrically rotate azimuth and elevation gimbals until HALOE Sun sensor is centered in the beam and aligned to UWY source within the acquisition field-of-view (± $1/2^{\circ}$).

____

4C.5.3 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null within 0.1 volt.

____

4C.5.4 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4C.5.5 Dump IETS screen entitled with paragraph number and record the following values.

AZIM __________ H __________ deg

ELEV __________ H __________ deg

CSS MAG __________ H __________ V

4C.5.6 Send command 0800H followed by command 0000H.

____

4C.6 Determine elevation positive and negative soft limits (azimuth limits will be default values).

4C.6.1 Elevation soft limits will be set to the following values.

4C.6.1.1 Elevation soft limit positive 01FEH (+8 deg).

4C.6.1.2 Elevation soft limit negative 0DFCH (-25 deg).

4C.6.2 Default values will be used for azimuth soft limits. These are:

4C.6.2.1 Azimuth soft limit positive 016CH (+185 deg).

4C.6.2.2 Azimuth soft limit negative 0E93H (-185 deg).

4C.7 Determine initial position values for azimuth and elevation.

4C.7.1 Record AZIM and ELEV from Para. 4C.5.4 and 4C.5.5.

Blackbody source [4C.4.4] AZIM ________________ deg
(Sunset)
ELEV ________________ deg

UWY source [4C.5.5] AZIM ________________ deg
(Sunrise)
ELEV ________________ deg

4C.7.2 Round these values to nearest degree.

Blackbody source AZIM ________________ deg
(Sunset)
ELEV ________________ deg

UWY source AZIM ________________ deg
(Sunrise)
ELEV ________________ deg

4C.7.3 Add 1 degree to all values above.

Blackbody source (Sunset) AZIM ______________ deg

ELEV ______________ deg

UWY source (Sunrise) AZIM ______________ deg

ELEV ______________ deg

4C.7.4 Convert these values to hexidecimal to determine sunset and sunrise initial positions.

4C.7.4.1 Sunset initial position AZIM ____________ H

ELEV ____________ H

4C.7.4.2 Sunrise initial position AZIM ____________ H

ELEV ____________ H

4C.8 Determine day and night stow azimuth and elevation gimbal positions.

4C.8.1 Record the values from Para. 4C.7.2.

Sunset AZIM ______________ deg

Sunrise AZIM ______________ deg

4C.8.2 Select an angle that is between these values for the night stow azimuth position (value is arbitrary).

Night stow AZIM ______________ deg

4C.8.3 Convert this value to hexidecimal using Table 1.

Night stow AZIM ______________ H

4C.8.4 The elevation gimbal night stow will be set to +5° using the hexidecimal value recorded below.

Night stow ELEV + 5 deg, 0317H

4C.8.5 Record the values from Para. 4C.4.4. These values will be used for the day stow positions (day stow leaves gimbals aligned to blackbody).

Day Stow Azimuth __________ H __________ deg

Day Stow Elevation __________ H __________ deg

4C.9 Determine sunrise and sunset "complete" elevation values. Default values will be used unless there are reasons these cannot be used. Default values are:

Sunrise Complete - Elevation 0C6FH (-20.7 deg)
Sunset Complete - Elevation 0DA2H (-24 deg)

If other values are used, record these below (any other values used must be more positive than -24 deg).

Sunrise Complete - Elevation __________ H __________ deg

Sunset Complete - Elevation __________ H __________ deg

4C.10 Determine sunrise and sunset enable thresholds.

4C.10.1 Record CSSMAG from Para. 4C.4.4 and 4C.5.5.

[4C.4.4] Sunset __________ H __________ V

[4C.5.5] Sunrise __________ H __________ V

4C.10.2 Choose enable thresholds that are slightly greater than 1/2 of the values recorded above.

Sunset enable threshold ______________ V

Sunrise enable threshold ______________ V

4C.10.3 Convert the values above to hexidecimal using Table 1.

4C.10.3.1 Sunset enable threshold ______________ H

4C.10.3.2 Sunrise enable threshold ______________ H

4C.11 Delay Time Initialization.

The "delay time for the sunset sequence will be set to 10 seconds by serial command 600AH.

____

4C.12 Determine cold wall gimbal positions for self thermal emissions test (do this ONLY for thermal-vacuum testing).

4C.12.1 Manually and/or electrically rotate azimuth and elevation gimbals until HALOE telescope has an unobstructed view of the nitrogen shroud.

____

4C.12.2 Dump IETS screen entitled "cold wall position" and record the following values.

4C.12.2.1 AZIM __________ H __________ deg

4C.12.2.2 ELEV __________ H __________ deg

4C.13 Determine AMO solar simulator gimbal positions for Solar Heating Test (do this ONLY for thermal-vacuum testing).

4C.13.1 Manually and/or electrically rotate azimuth and elevation gimbals and position the AMO solar simulator until the HALOE Sun sensor and telescope are centered in the beam and aligned to within ± 1/2 deg. NOTE: All personnel performing this test shall wear the proper eye protective shields.

____

4C.13.2 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null within 0.1 volt.

____

4C.13.3 Dump IETS screen entitled "AMO SS Position" and record the following values.

AZIM __________ H __________ deg

ELEV __________ H __________ deg

CSSMAG __________ H __________ V

4C.13.4 Send command 0800H followed by command 0000H.

____

4C.14 Fill in the table below for all initialization values.

INSTRUMENT INITIALIZATION VALUES - TWO SOURCES, NO RATE TABLE

Para.	Parameter	Value
4C.6.1.1	Soft limit pos - elevation	01FEH
4C.6.1.2	Soft limit neg - elevation	0DFCH
4C.6.2.1	Soft limit pos - azimuth	016CH
4C.6.2.2	Soft limit neg - azimuth	0E93H
4C.7.4.1	Sunset initial position - elevation	____H
4C.7.4.1	Sunset initial position - azimuth	2___H
4C.7.4.2	Sunrise initial position - elevation	____H
4C.7.4.2	Sunrise initial position - azimuth	1___H
4C.8.5	Day stow position - elevation	D___H
4C.8.5	Day stow position - azimuth	3___H
4C.8.4	Night stow position - elevation	E317H
4C.8.3	Night stow position - azimuth	4___H
4C.9	Sunset complete - elevation	____H
4C.9	Sunrise complete - elevation	____H
4C.10.3.1	Sunset enable threshold	C___H
4C.10.3.2	Sunrise enable threshold	B___H
4C.11	Delay time	600AH

GIMBAL INITIALIZATION FOR SELF EMISSIONS TEST
(Thermal-Vacuum Only)

Para.	Parameter	Value
4C.12.2.1	Azimuth cold wall position	____H
4C.12.2.2	Elevation cold wall position	____H

GIMBAL INITIALIZATION FOR SOLAR REJECTION TEST
Thermal-Vacuum Only

Para.	Parameter	Value
4C.13.3	Azimuth AMO SS position	____H
4C.13.3	Elevation AMO SS position	____H

4C.15 Use the command editor to review the current values in the NEWGM command file. Update this command file to the values recorded in Para. 4C.14.

____

4C.16 Send and dump command file NEWGM.

____

4C.17 Dump IETS screen entitled "Initialization C, Para. 4C.17."

____

4C.18 Annotate IETS tape "End of Initialization C, Para. 4C.18."

____

4C.19 Instrument Initialization C is complete.

______________	________________	__________________
Date	Test Conductor	R&QA

CAUTION: The NEWGM command file must be sent each time the sunset/sunrise sequence in Para. 6C is performed. The initial position values for azimuth and elevation for both sunset and sunrise are automatically updated when gimbals complete acquisition, which forces a reinitialization to perform another sequence.

4D.0 INITIALIZATION WITH ONE SOURCE AND NO RATE TABLE

This procedure is used to initialize the instrument to match specific test setup conditions when the test setup employs only ONE source and NO rate table. Use Para. 4A.0, 4B.0, or 4C.0 for other test setup conditions. This sequence will be used for the lowest level of radiometric/gimbal testing. Only one drift test will be performed and only in the sunset sequence.

4D.1 Identify source.

____

4D.2 Verify the following:

4D.2.1 Instrument is mounted vertically and can rotate freely in azimuth.

____

4D.2.2 Sun sensor does not have neutral density filter installed if UWY source is used.

____

4D.2.3 Test setup preparation per Para. 2.4 is complete.

____

4D.2.4 Instrument power-on per Para. 3.0 is complete.

____

4D.2.5 AGC switch is set to "On" if GCETS is in test setup.

____

4D.3 Annotate IETS tape "Begin Initialization D, Para. 4D.3."

____

4D.4 Determine AZIM and ELEV values to align instrument to source.

4D.4.1 Manually and/or electrically rotate azimuth and elevation gimbals until HALOE Sun sensor and telescope are centered in beam and aligned to the source within acquisition field-of-view ($\pm 1/2^{\circ}$).

____

4D.4.2 Send command 0880H (coarse track) and wait for CSSAZ and CSSEL to null within 0.1 volt.

____

4D.4.3 Send command 08A0H (fine track) and wait for FSSTOP to reach 125 ± 1.

____

4D.4.4 Dump IETS screen entitled with paragraph number and record the following values.

Sunset AZIM __________ H __________ deg

ELEV __________ H __________ deg

CSS MAG __________ H __________ V

4D.4.5 Send command 0800H followed by command 0000H.

____

4D.5 Determine elevation positive and negative soft limits (azimuth limits will be default values).

4D.5.1 Elevation soft limits will be set to the following values.

4D.5.1.1 Elevation soft limit positive 01FEH (+8 deg).

4D.5.1.2 Elevation soft limit negative 0DFCH (-25 deg).

4D.5.2 Default values will be used for azimuth soft limits. These are:

4D.5.2.1 Azimuth soft limit positive 016CH (+185 deg).

4D.5.2.2 Azimuth soft limit negative 0E93H (-185 deg).

4D.6 Determine initial position values for azimuth and elevation.

4D.6.1 Record AZIM and ELEV from Para. 4D.4.4.

Blackbody source [4D.4.4] AZIM ______________ deg

ELEV ______________ deg

4D.6.2 Round these values to nearest degree.

AZIM ______________ deg

ELEV ______________ deg

4D.6.3 Add 1 degree to the values above. These will be used as initial position values for sunset.

AZIM ______________ deg

ELEV ______________ deg

4D.6.4 Convert these values to hexidecimal for sunset initial positions.

Sunset initial position AZIM ____________ H

ELEV ____________ H

4D.7 Determine day and night stow azimuth and elevation gimbal positions.

4D.7.1 Record the values from Para. 4D.6.2.

AZIM ______________ deg

ELEV ______________ deg

4D.7.2 Add 30 deg. to AZIM and 5 deg. to ELEV. These will be used for both day and night stow positions.

AZIM ______________ deg

ELEV ______________ deg.

4D.7.3 Convert these values to hexidecimal.

Day and night stow AZIM ______________ H

Day and Night Stow ELEV ______________ H

4D.8 Determine sunset "complete" elevation value. The default value will be used unless there are reasons prohibiting its use. The default value is:

Sunset Complete - Elevation 0DA2H (-24 deg)

If a different value is used, record below:

Sunset Complete - Elevation __________ H __________ deg

4D.9 Determine sunset enable thresholds.

4D.9.1 Record CSSMAG from Para. 4D.4.4.

CSSMAG _____________ H

4D.9.2 Choose an enable threshold that is slightly greater than 1/2 of the value recorded above.

Enable threshold ________________ V

4D.9.3 Convert this value above to hexidecimal using Table 1.

Sunset enable threshold ________________ H

4D.10 Delay Time Initialization.

The "delay time" for the sunset sequence will be set to 10 seconds by serial command 600AH.

4D.11 Fill in the table below for all initialization values.

INSTRUMENT INITIALIZATION VALUES - ONE SOURCE, NO RATE TABLE

Para.	Parameter	Value
4D.5.1.1	Soft limit pos - elevation	01FEH
4D.5.1.2	Soft limit neg - elevation	0DFCH
4D.5.2.1	Soft limit pos - azimuth	016CH
4D.5.2.2	Soft limit neg - azimuth	0E93H
4D.6.4	Sunset initial position - elevation	___H
4D.6.4	Sunset initial position - azimuth	2___H
4D.7.3	Day stow position - elevation	D___H
4D.7.3	Day stow position - azimuth	3___H
4D.7.3	Night stow position - elevation	0317H
4D.7.3	Night stow position - azimuth	4___H
4D.8	Sunrise complete - elevation	___H
4D.9.4	Sunset enable threshold	C___H
4D.11	Delay time	600AH

4D.12 Use the command editor to review the current values in the NEWGM command file. Update this command file to the values recorded in Para. 4D.11.

____

4D.13 Send command file NEWGM.

____

4D.14 Dump IETS screen entitled "End of Initialization D, Para. 4D.14."

____

4D.15 Annotate IETS tape "End of Initialization D, Para. 4D.15."

____

4D.16 Instrument Initialization D is complete.

Date	Test Conductor	R&QA

CAUTION: The NEWGM command file must be sent each time the sunset sequence in Para. 6D is performed. The initial position values for azimuth and elevation are automatically updated when gimbals complete acquisition, which forces a reinitialization to perform another sequence.

5.0 COMMAND/MODE TEST

This test is run to verify instrument software. It must be run immediately after any software update to internal ROM, and during the last Level I test.

Verify rate table rotates elevation axis and the power-up and initialization is complete.

______________ ______________ ______________
Date Test Conductor R&QA

5.1 Spacecraft Turn-Around Command Test

5.1.1 Annotate the tape with "Spacecraft Turn-Around Command Test."

____

5.1.2 Send the command file TURN ______________.

- Sunrise azimuth position (1 cmd)
- Sunset azimuth position (1 cmd)
- Day stow azimuth position (1 cmd)
- Day stow elevation position (1 cmd)
- Night stow azimuth position (1 cmd)
- Night stow elevation position (1 cmd)
- Spacecraft direction flag/word (2 cmds via memory update cmd)

5.1.3 Use a printout of the TURN file, command echo screen, and memory dump to verify command was sent and received properly.

____

5.1.4 Annotate tape "End Spacecraft Turn-Around Command Test, Para. 5.1.4."

____

5.2 Operating Modes Test

5.2.1 Annotate tape with "Start Operating Modes Test, Para. 5.2.1."

____

5.2.2 Manually command the instrument to each operating mode using the same sequence as the sunset automatic sequence. Verify proper instrument operating mode using the data sheet provided below.

OPERATION MODES DATA SHEET

Send Command	Desired Mode	Desired XTask	Actual Mode	Actual XTask	Note
0840	2	0	______	______	Slew-To-Initial-Position
0860	3	0	______	______	Coarse acquisition
0880	4	0	______	______	Coarse track
08A0	5	0	______	______	Fine track
08C0	6	0	______	______	Fine acquisition
0900	0	2	______	______	Auto gas balance
0AC0	6	3	______	______	Elevation scan
0CC0	6	7	______	______	Cal wheel Home while in track
08E0	7	0	______	______	Slew-To-Stow
0800	0	0	______	______	Return to telemetry only
0C00	0	7	______	______	Cal wheel Home
0820	1	0	______	______	Command balance
0B00	0	5	______	______	Step Cal Wheel

5.3 Command O Test

Verify proper instrument response to all combinations of command O.

____

5.3.1 Annotate the tape with "Start Command O Test."

____

5.3.2 Send all 256 combinations of command 0 that affect xtask and mode by running program CMD256.

____

5.3.3 Verify the instrument switches to command mode and xtask for each command sent. Print out the command echo data and include the printout as part of this document. This printout should include a list of the commands sent by program CMD256.

____

5.3.4 Annotate the tape with "End Command 0 Test."

5.4 Commands 1 Thru 14

Verify the instrument maintains proper operational sequence while sending commands 1 thru 14.

5.4.1 Annotate the tape with "Start Commands Test, Para. 5.4.1."

____

5.4.2 Place the instrument in the Track mode.

____

5.4.3 Send command file CMDS14. (CMDS14 will automatically send commands 1 thru 14).

____

5.4.4 Verify the instrument maintains proper track sequence while commands 1 thru 14 are being sent.

____

5.4.5 Place the instrument in the Slew-To-Stow mode.

____

5.4.6 Send command file CMDS14.

____

5.4.7 Verify the instrument maintains proper Slew-To-Stow sequence while commands 1 thru 14 are being sent.

____

5.4.8 Place the instrument in the Slew-To-Initial-Position mode.

____

5.4.9 Send command file CMDS14.

____

5.4.10 Verify the instrument maintains proper Slew-To-Initial-Position sequence while commands 1 thru 14 are being sent.

____

5.4.11 Annotate the tape with "End Commands 1 Thru 14 Test, Para. 5.4.11."

____

5.5 Command 15 (Memory Update)

Generate an instrument operational malfunction by sending random erroneous Memory Update commands. Then verify that proper instrument operation can be recovered by cycling instrument power OFF and ON in the same manner that power will be cycled in flight by the UARS.

5.5.1 Annotate the tape with "Start Memory Update Test."

____

5.5.2 With the instrument operating properly, monitor the instrument sync signal and data response on the screen. Send random erroneous Memory Update commands until the instrument response indicates that the instrument has malfunctioned.

____

5.5.3 Verify by the instrument response that proper instrument operation can be recovered by cycling the instrument power OFF and ON in the same manner that power will be cycled in flight by the UARS. The UARS power ON command file is PUPCMD which contains the following commands:

- Sunrise azimuth position (1 cmd)
- Sunset azimuth position (1 cmd)
- Day stow azimuth position (1 cmd)
- Day stow elevation position (1 cmd)
- Night stow azimuth position (1 cmd)
- Night stow elevation position (1 cmd)
- Coarse Sun Sensor Sunrise threshold (1 cmd)
- Coarse Sun Sensor Sunset threshold (1 cmd)
- Fine Sun Sensor elevation offset (1 cmd)
- Delay time (1 cmd)
- Sunrise elevation position (4 cmds via memory update cmd)

- Sunset elevation position (4 cmds via memory update cmd)
- 4 balance commands (4 cmd optional depending on auto balance performance)
- Spacecraft direction flag/word (2 cmds via memory update cmd)

Use printout of PUPCMD file, command echo, and memory dump for verification.

____

5.5.4 Annotate the tape with "Power Cycle Repeat 1, Para. 5.5.4."

____

5.5.5 Repeat steps 5.5.2 and 5.5.3 using different random memory update data.

____

5.5.6 Annotate the tape with "Power Cycle Repeat 2, Para. 5.5.6."

____

5.5.7 Repeat steps 5.5.2 and 5.5.3 using different random memory update data.

____

5.5.8 Annotate the tape with "End Memory Update Test, Para. 5.5.8."

5.6 Command Interval Time

Verify the minimum time required between commands.

5.6.1 Annotate the tape with "Start Time Interval Test, Para. 5.6.1."

____

5.6.2 Start at 20 ms between commands. Then vary the time interval around 20 ms while observing the data and note the minimum time interval between commands below which the data screws up. Record the minimum time interval.

____

5.6.3 Annotate the tape with "End Time Interval Test, Para. 5.6.3."

____

5.7 Instrument Reinitialization

5.7.1 Annotate the tape "Start of Memory Reinitialization, Para. 5.7.1."

____

5.7.2 Repeat appropriate commands in Paragraph 4.0 to set memory to the correct values.

____

5.7.3 Annotate the tape "End Memory Reinitialization, Para. 5.7.3."

____

5.7.4 Command Mode Test is complete.

Date	Test Conductor	R&QA

6A.0 ORBIT SEQUENCE A TEST

This procedure is used to simulate routine sunrise/sunset orbital operation of the instrument and also provides radiometric measurements of initial offsets, 15 minute drift, 45 minute drift, and noise. It will be used for all Level I performance verification testing when fine Sun sensor does not have the neutral density filter installed. It may also be used for Level II tests using the Portable Stimulus Test Set.

6A.1 Verify the test setup is complete.

6A.1.1 Blackbody used is ______________.

6A.1.2 Blackbody is aligned ______________.

6A.1.3 UWY source is aligned ______________.

6A.1.4 Sun sensor does not have neutral density filter installed.

____

6A.1.5 Instrument is mounted to 90° bracket so that rate table rotates elevation axis with the Sun sensor and telescope in the center of the collimated beam.

____

6A.1.6 AGC switch set to "On" if GCETS connected.

____

6A.1.7 Send NEWGM command if necessary (read CAUTION at end of Para. 4A).

____

6A.1.8 Instrument Power-On and Initialization complete.

______________	______________	______________
Date	Test Conductor	R&QA

6A.2 Annotate IETS tape "Start Orbit Sequence A Test, Para. 6A.2."

____

6A.3 Set rate table to position recorded in Para. 4A.14.

____

6A.4 Start rate table at a -0.01 deg/sec rate.

____

6A.5 Send sunset command.

____

6A.6 Verify visually and from IETS monitor that the instrument slews to initial position (Mode 3, xtask 0).

____

6A.7 Verify visually and from IETS monitor that instrument performs acquisition. Dump "SUN" screen entitled with paragraph number and record.

Serial Command 2 Value ________________ H

Time ________________

6A.8 Verify visually and from IETS monitor that instrumet performs auto balance sequence (takes approximately 2 minutes, instrument goes to MOde 6, xtask 2).

____

6A.9 Verify visually and from IETS monitor that the instrument executes elevation scan cycles (Mode 6, xtask 3).

____

6A.10 Verify visually and from IETS monitor that instrument performs cal wheel sequence (Telemetry CSS = 0, 1, 2,...11 and stops at 0, Mode 6, xtask 5 and 6).

____

6A.11 Verify instrument advances to Mode 6, xtask 8 for data period.

____

6A.12 Stop rate table.

____

6A.13 Send annotate to IETS "Begin Drift Test #1, Para. 6A.13" and immediately dump IETS "Sun" screen entitled with paragraph number. Record the following telemetry below.

TIME ________________

ELEV ________________ H

AZIM ________________ H

CSSAZ ________________ V

CSSEL ________________ V

CSSMAG ________________ V

FSSTOP ________________

FSSBOT ________________

Serial Command 2 ________________ H

6A.14 Verify the azimuth initial position register updated.

6A.14.1 Record serial command 2 value from Para. 6A.7.

________________ H

6A.14.2 Verify this value is different from the value recorded in Para. 6A.13.

____

6A.15 After 15 1/2 minutes from time recorded in Para. 6A.13, send annotate to tape "End Drift Test #1, Para. 6A.15."

____

6A.16 Start rate table rate to -0.05 deg/sec.

____

6A.17 Verify data mode terminates and gimbals slew-to-stow (Mode 6, xtask 0).

____

6A.18 Verify from IETS monitor that instrument returns to "Telemetry Only" in Mode 0, xtask 0.

____

6A.19 Stop rate table ________________.

6A.20 Dump IETS "Sun" screen titled with paragraph number and record.

TIME ______________

AZIM ______________ H

ELEV ______________ H

6A.21 Send annotate to tape "Complete Sunset A, Begin Sunrise A Test, Para. 6A.21."

____

6A.22 Reinitialize rate table to sunrise position determined in Para. 4A.14.

____

6A.23 Verify UWY source intensity is off, but ready to be turned on.

____

6A.24 Dump IETS screen entitled with paragraph number and record

Serial Command 1 ______________ H

TIME ______________

6A.25 Send "sunrise" command and verify visually and by IETS monitor that gimbals slew from night stow to initial position (Mode 2, xtask 9).

____

6A.26 Verify visually and from IETS monitor that instrument performs acquisition (Mode 6, xtask AH).

____

6A.27 Start rate table to 0.05 deg/sec.

____

6A.28 Verify instrument advances to Mode 6, xtask 10 for data sequence.

____

6A.29 Dump IETS "Sun" screen entitled with paragraph number and record the values below:

AZIM ________________ H

CSSEL ________________ V

CSSAZ ________________ V

CSSMAG ________________ V

FSSTOP ________________

FSSBOT ________________

Serial Command 1 ________________

6A.30 Verify the azimuth initial position register updated.

6A.30.1 Record serial command 1 value from Para. 6A.24.

________________ H

6A.30.2 Verify this value is different from the value recorded in Para. 6A.29.

____

6A.31 Verify track mode is terminated by angular trip (Mode 6, xtask 12 and 13).

____

6A.32 Stop rate table after angular trip and reset to 0.01 deg/sec.

____

6A.33 Verify from IETS monitor that cal wheel sequence is performed (CS3 = 0, 1, 2...11, and stops at 0).

____

6A.34 Verify visually and from IETS telemetry that instrument executes elevation scan cycles (Mode 6, xtask FH).

____

6A.35 Verify visually and from IETS monitor that instrument slews-to-day-stow.

____

6A.36 Verify instrument returns to "Telemetry Only" in Mode O, xtask O. Stop rate table at this point.

____

6A.37 Dump IETS "Sun" screen entitled with Para. No. and record.

TIME ________________

ELEV ________________ H

AZIM ________________ H

6A.38 Annotate IETS tape "End of Sunrise Test, Para. 6A.38."

____

6A.39 Electrically and/or manually position rate table and gimbals so that Sun sensor is aligned to blackbody source within acquisition field-of-view (± 1/2 deg).

____

6A.40 Send command 0880H (coarse track) and wait a few seconds for azimuth and elevation errors to null within 0.1 volt. Now send 0800H followed by 0000H to place instrument in "Telemetry Only" mode (Mode 0, xtask 0).

____

6A.41 Prepare IETS tape annotate "Begin Drift Test #2, Para. 6A.41" but do not send yet.

____

6A.42 Record time of "Begin Drift Test #1" annotate from Para. 6A.13 and add 45 minutes.

Begin Drift Test #1 ____________
+ 45 min

Begin Drift Test #2 ____________

6A.43 Send annotate from Para. 6A.41 at proper time on IETS.

____

6A.44 After 15 1/2 minutes, send annotate to IETS tape "End Drift Test #2, Para. 6A.44."

____

6A.45 Turn off UWY source.

____

6A.46 Orbit Sequence A Test is complete.

Date	Test Conductor	R&QA

POST-TEST DATA ANALYSIS

6A.47 Plot mode and xtask vs. time for sunset sequence and again for sunrise sequence.

____

6A.48 Compare plots to Figure 6A.48-1 for sunset and Figure 6A.48-2 for sunrise. Verify the following mode and xtask changes are correct.

Mode, xtask	Sunset	Sunrise
Slew-from-Stow	______	______
Acquisition	______	______
Time Delay	______	______
Auto Balance	______	______
Cal Wheel Step	______	______
Solar Scans	______	______
Data Sequence	______	______
Slew-to-Stow	______	______

Figure 6A.48-1. Mode and Xtask for typical Sunset Event

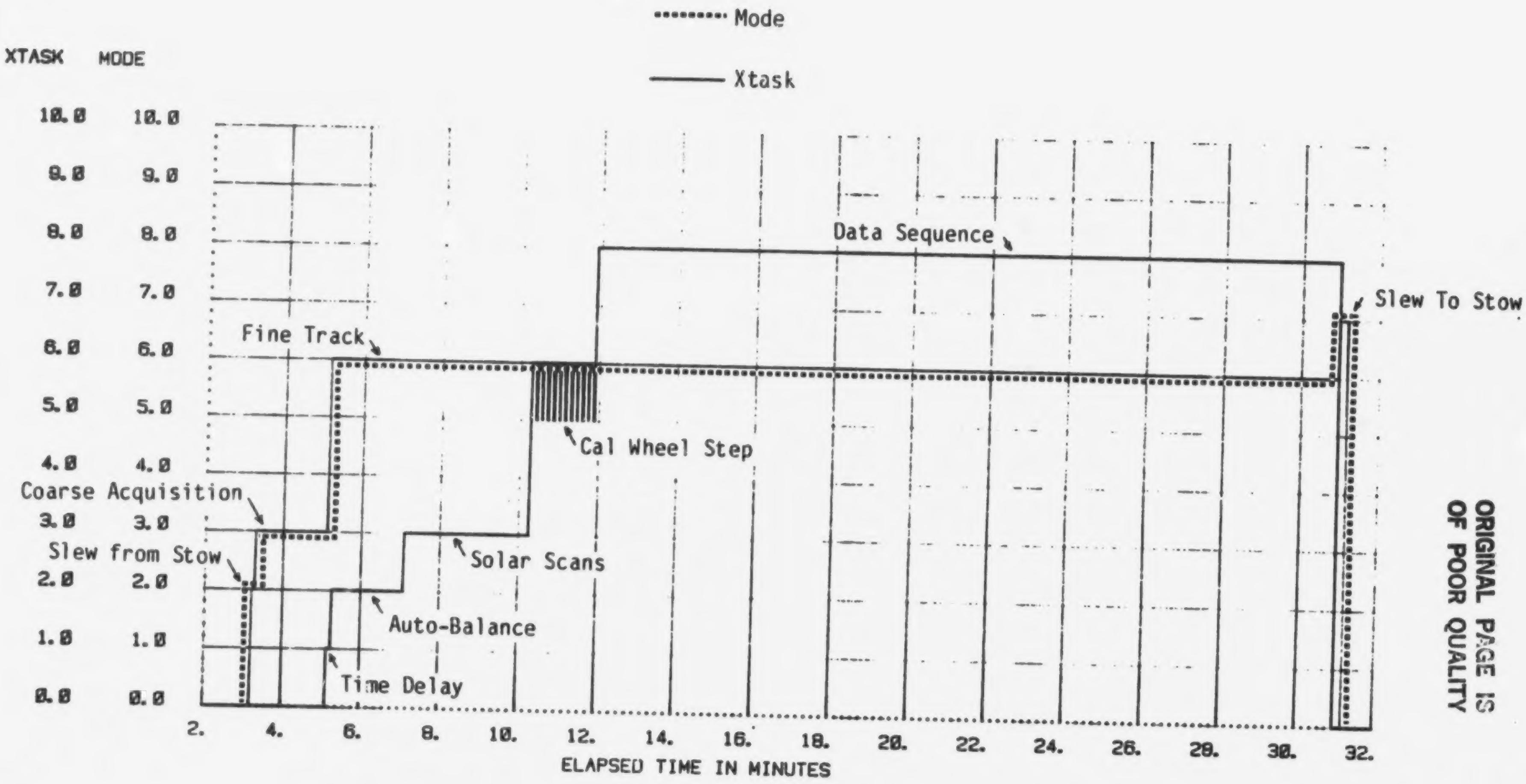

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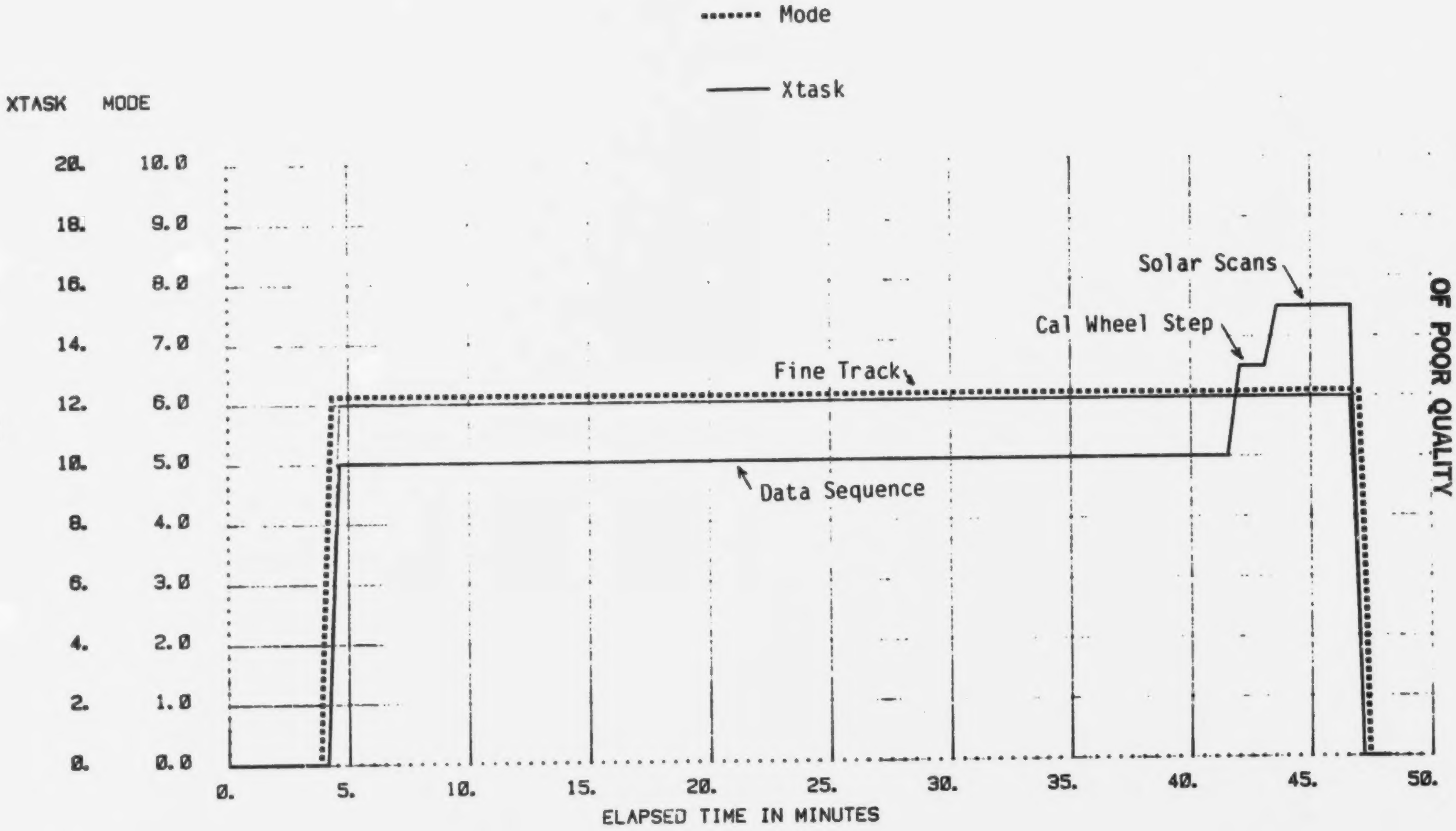
Figure 6A.48-2. Mode and Xtask for a typical Sunrise Orbit Sequence B Event (Slew-from-Stow, Coarse Acquisition, and Slew-to-Stow Modes are missing in an Orbit Sequence B Sunrise Event).



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6A.49 Drift Test

Run NEM analysis program beginning at tape annotate "Begin Drift Test #1" and again at annotate "Begin Drift Test #2." Correct the NEM (ppm) data to exoatmospheric intensity using the factors given. Complete the table below.

Parameter	HCl	HF	CH_4	NO
Correction Factor	2.96	5.09	3.38	3.24
NEM uncorrected				
NEM corrected				
15 min drift #1				
15 min drift #2				
*45 min drift				
V (1) avg				
V (2) avg				
DV (1) offset				
DV (2) offset				

* This value is calculated from the two 15 min. data sets.

6A.50 Dump raw data while instrument is in Mode 2, xtask O for sunset and Mode 3, xtask O for sunrise to determine sunset and sunrise initial positions. The times for the data dump can be obtained from the plots generated in step 6A.47.

Initial Position	Sunset	Sunrise
Azim	______ H	______ H
Elev	______ H	______ H

6A.51 Fill out data sheet below. Compare actual values to set values where appropriate.

Parameters	Set Value	Para.	Actual Value	Para.	Specification
SUNSET					
Initial Position - ELEV		4A.8.4.1		6A.50	
Initial Position - AZIM		4A.8.4.1		6A.50	
Track Position - ELEV		4A.5.4		6A.13	
Track Position - AZIM		4A.5.4		6A.13	
CSSAZ				6A.13	
CSSEL				6A.13	
FSSTOP	125			6A.13	
FSSBOT	244			6A.13	
CSSMAG		4A.5.4		6A.13	
Night Stow Position-ELEV	-5 deg	4A.9.4.2		6A.20	
Night Stow Position-AZIM		4A.9.3.2		6A.20	
SUNRISE					
Initial Position - ELEV		4A.8.4.2		6A.50	
Initial Position - AZIM		4A.8.4.2		6A.50	
Track Position - AZIM		4A.6.5		6A.29	
CSSAZ				6A.29	
CSSEL				6A.29	
FSSTOP	125			6A.29	
FSSBOT	244			6A.29	
CSSMAG		4A.6.5		6A.29	
Day Stow Position - ELEV	+5 deg	4A.9.4.1		6A.37	
Day Stow Position - AZIM		4A.9.3.1		6A.37	

6A.52 Plot the following dta, with parameters listed together on same graph. Sunrise and sunset data will be plotted on separate graphs.

Parameters	Sunset	Sunrise
1. FSSBOT, FSSTOP		
2. CSSEL, CSSAZ, ELEV, AZIM		
3. HFAGC, HCLAGC, CH_4AGC, NOAGC		N.A.
4. HFDAGC, HCLDAGC, CH_4AGC, NODAGC		N.A.
5. HFV, HFDV		N.A.
6. HFR, HFDR		N.A.
7. HCLV, HCLDV		N.A.
8. HCLR, HCLDR		N.A.
9. CH_4V, CH_4DV		N.A.
10. CH_4R, CH_4DR		N.A.
11. NOV, NODV		N.A.
12. NOR, NODR		N.A.

6A.53 Compare the data plots generated above to the baseline data set. Record anomalies.

____

6A.54 For Level I testing, Paragraphs 6A.1 - 6A.53 must be repeated for primary and heater/motor supply voltages of 24 and 35 volts. These are adjusted on the front panel of the IETS. Copy appropriate pages of this procedure for these tests. Redline "35 volts" and "24 volts" at the top of each page to indicate.

6A.54.1 Verify primary and heater/motor supply voltages are 35 volts.

____

6A.54.2 Verify Pfaragraphs 6A.1 - 6A.47 have been repeated for primary and heater/motor supply voltages of 35 volts.

Date	Test Conductor	R&QA

6A.54.3 Verify primary and heater/motor supply voltages are 24 volts.

____

6A.54.4 Verify Paragraphs 6A.1 - 6A.53 have been repeated for primary and heater/motor supply voltages of 24 volts.

____________	____________	____________
Date	Test Conductor	R&QA

6B.0 ORBIT SEQUENCE B TEST

This procedure is used to simulate routine sunrise/sunset orbital operation of the instrument and also provides radiometric measurements of initial offsets, 15 minute drift, 45 minute drift, and noise. It will be used when the rate table is in the setup but only one blackbody source is available.

6B.1 Verify the test setup is complete.

6B.1.1 Blackbody used is ______________.

6B.1.2 Blackbody is aligned ______________.

6B.1.3 Rate table rotates elevation axis.

____

6B.1.4 AGC switch set to "On" if GCETS connected.

____

6B.1.5 Send NEWGM command file if necessary (read CAUTION at end of Para. 4B).

____

6B.1.6 Instrument Power-On and Initialization per Paragraph 4B.0 is complete.

______________	______________	______________
Date	Test Conductor	R&QA

6B.2 Annotate IETS tape "Start Orbit Sequence B Test, Para. 6B.2."

____

6B.3 Set rate table to position recorded in Para. 4B.12.2.

____

6B.4 Start rate table at a -0.01 deg/sec rate ______________.

6B.5 Send sunset command.

____

6B.6 Verify visually and from IETS monitor that the instrument slews to initial position (Mode 3, xtask 0).

____

6B.7 Verify visually and from IETS monitor that instrument performs acquisition. Dump "Sun" screen entitled with paragraph number and record

Serial command 2 Value ______________H

Time ______________

6B.8 Verify visually and from IETS monitor that instrument performs auto balance sequence (takes approximately 2 minutes, instrument goes to MOde 6, xtask 2).

____

6B.9 Verify visually and from IETS monitor that the instrument executes elevation scan cycles (Mode 6, xtask 3).

____

6B.10 Verify visually and from IETS monitor that instrument performs cal wheel sequence (telemetry CS3 = 0, 1, 2,...11 and stops at 0, Mode 6, xtask 5 and 6).

____

6B.11 Verify instrument advances to Mode 6, xtask 8 for data period.

____

6B.12 Stop rate table.

____

6B.13 Send annotate to IETS "Begin Drift Test #1, Para. 6B.13" and immediately dump IETS "Sun" screen entitled with paragraph number. Record the following telemetry values below.

TIME ______________

ELEV ______________ H

AZIM ______________ H

CSSAZ ______________ V

CSSEL ______________ V

CSSMAG ______________ V

FSSTOP ______________

FSSBOT ______________

Serial Command 2 ______________ H

6B.14 Verify the azimuth initial position register updated.

6B.14.1 Record serial command 2 value from Para. 6B.7.

________________ H

6B.14.2 Verify this value is different from the value recorded in Para. 6B.13.

____

6B.15 After 15 1/2 minutes from time recorded in Para. 6B.13, send annotate to tape "End Drift Test #1, Para. 6B.15."

____

6B.16 Start rate table rate to -0.05 deg/sec.

____

6B.17 Verify data mode terminates and gimbals slew-to-stow (Mode 6, xtask 0).

____

6B.18 Verify from IETS monitor that instrument returns to "Telemetry Only" in Mode 0, xtask 0.

____

6B.19 Stop rate table ________________.

6B.20 Dump "Sun" screen titled with paragraph number and record.

TIME ________________

AZIM ________________ H

ELEV ________________ H

6B.21 Send annotate to tape "Complete Sunset B, Begin Sunrise B Test, Para. 6B.21."

____

6B.22 Reinitialize rate table to position determined in Para. 4B.12.1.

____

6B.23 Dump IETS screen entitled with paragraph number and record the following data.

Serial Command 1 ________________ H

TIME ________________

6B.24 Send "sunrise" command and verify visually and by IETS monitor that gimbals slew from night stow to initial position (Mode 2, xtask 9).

____

6B.25 Verify visually and from IETS monitor that instrument performs acquisition (Mode 6, xtask AH).

____

6B.26 Verify instrument advances to Mode 6, xtask 10 for data sequence.

____

6B.27 Dump IETS "Sun" screen entitled with paragraph number and record the values below:

TIME ________________

ELEV ________________ H

AZIM ________________ H

CSSEL ________________ V

CSSAZ ________________ V

CSSMAG ________________ V

FSSTOP ________________

FSSBOT ________________

Serial Command 1 ________________ H

6B.28 Verify the azimuth initial position register updated.

6B.28.1 Record serial command 1 value from Para. 6B.23.

________________ H

6B.28.2 Verify this value is different from the value recorded in Para. 6B.27.

____

6B.29 Record time of "Begin Drift Test #1" annotate from Para. 6B.13 and add 45 minutes.

Begin Drift Test #1 __________

+ 45 min

Begin Drift Test #2 __________

6B.30 Prepare annotate to IETS tape "Begin Drift Test #2, Para. 6B.30" and send at the time calculated in Para. 6B.29.

____

6B.31 After 15 1/2 minutes from annotate in Para. 6B.30, annotate to IETS tape "End Drift Test #2, Para. 6B.31."

____

6B.32 Start rate table to +0.05 deg/sec rate.

____

6B.33 Verify data sequence terminates by angular trip and cal sequence begins (Value was determined in Para. 4B.9.4. Instrument sequences to Mode 6, xtask 12 and 13).

____

6B.34 Stop rate table and reset to +0.01 deg/sec.

____

6B.35 Verify from IETS monitor that cal wheel sequence is performed (CS3 = 0, 1, 2...11, and stops at 0).

____

6B.36 Verify visually and from IETS telemetry that instrument executes elevation scan cycles (Mode 6, xtask FH).

____

6B.37 Verify visually and from IETS monitor that instrument slews-to-day-stow (Mode 0, xtask 0).

____

6B.38 Verify instrument returns to "Telemetry Only" in Mode 0, xtask 0. Stop rate table at this point.

____

6B.39 Dump IETS "Sun" screen entitled with paragraph number and record.

TIME ________________

AZIM ________________ H

ELEV ________________ H

6B.40 Annotate IETS tape "End of Sunrise Test - B Sequence, Para. 6B.40."

____

6B.41 Orbit Sequence B Test is complete.

________________ ________________ ________________
Date Test Conductor R&QA

POST-TEST DATA ANALYSIS

6B.42 Plot mode and xtask vs. time for sunset sequence and again for sunrise sequence.

____

6B.43 Compare plots to Figure 6A-1 for sunset and Figure 6A-2 for sunrise. Verify the following mode and xtask changes are correct.

Mode, xtask	Sunset	Sunrise
Slew-from-Stow		
Acquisition		
Time Delay		N.A.
Auto Balance		N.A.
Cal Wheel Step		
Solar Scans		
Data Sequence		
Slew-to-Stow		

6B.44 Drift Test

Run NEM analysis program beginning at tape annotate "Begin Drift Test #1" and again at annotate "Begin Drift Test #2." Correct the NEM (ppm) data to exoatmospheric intensity using the factors given. Complete the table below.

Parameter	HCl	HF	CH_4	NO
Correction Factor	2.96	5.09	3.38	3.24
NEM uncorrected				
NEM corrected				
15 min drift #1				
15 min drift #2				
*45 min drift				
V (1) avg				
V (2) avg				
Delta V (1) offset				
Delta V (2) offset				

* This value is calculated from the two 15 min. drift data sets.

6B.45 Dump raw data while instrument is in Mode 2, xtask 0 for sunset and Mode 3, xtask 0 for sunrise to determine sunset and sunrise initial positions. The times for the data dump can be obtained from the plots generated in Para. 6B.42.

Initial Position	Sunset	Sunrise
Azim	______ H	______ H
Elev	______ H	______ H

6B.46 Fill out data sheet below. Compare actual values to set values where appropriate.

Parameters	Set Value	Para.	Actual Value	Para.	Specification
SUNSET					
Initial Position - ELEV		4B.7.4		6B.45	
Initial Position - AZIM		4B.7.4		6B.45	
Track Position - ELEV		4B.5.4		6B.13	
Track Position - AZIM		4B.5.4		6B.13	
CSSAZ				6B.13	
CSSEL				6B.13	
FSSTOP	125			6B.13	
FSSBOT	244			6B.13	
CSSMAG				6B.13	
Night Stow Position-ELEV	06BAH			6B.20	
Night Stow Position-AZIM		4B.8.3.2		6B.20	
SUNRISE					
Initial Position - ELEV		4B.7.4		6B.45	
Initial Position - AZIM		4B.7.4		6B.45	
Track Position - ELEV		4B.5.4		6B.27	
Track Position - AZIM		4B.5.4		6B.27	
CSSAZ				6B.27	
CSSEL				6B.27	
FSSTOP	125			6B.27	
FSSBOT	244			6B.27	
CSSMAG				6B.27	
Day Stow Position - ELEV	0317H			6B.39	
Day Stow Position - AZIM		4B.8.3.1		6B.39	

6B.47 Plot the following data, with parameters listed together on same graph. Sunrise and sunset data will be plotted on separate graphs.

Parameters	**Sunset**	**Sunrise**
1. FSSBOT, FSSTOP	______	______
2. CSSEL, CSSAZ, ELEV, AZIM	______	______
3. HFAGC, HCLAGC, CH_4AGC, NOAGC	______	______
4. HFDAGC, HCLDAGC, CH_4AGC, NODAGC	______	______
5. HFV, HFDV	______	______
6. HFR, HFDR	______	______
7. HCLV, HCLDV	______	______
8. HCLR, HCLDR	______	______
9. CH_4V, CH_4DV	______	______
10. CH_4R, CH_4DR	______	______
11. NOV, NODV	______	______
12. NOR, NODR	______	______

6B.48 Compare the data plots generated above to the baseline data set. Record anomalies.

____

6C.0 ORBIT SEQUENCE C TEST

This procedure is used to simulate routine sunrise/sunset orbital operation of the instrument when no rate table is present and also provides radiometric measurements of initial offsets, 15 minute drift, 45 minute drift, and noise. It will be used for all Level II performance verification testing in the thermal-vacuum chamber.

6C.1 Verify the test setup is complete.

6C.1.1 Blackbody used is __________.

6C.1.2 Blackbody is aligned __________.

6C.1.3 UWY source is aligned _______________.

6C.1.4 Sun sensor does not have neutral density filter installed.

____

6C.1.5 AGC switch set to "On" if GCETS connected.

____

6C.1.6 Send NEWGM command if necessary (read CAUTION at end of Para. 4C).

____

6C.1.7 Instrument Power-On and Initialization per Para. 4C is complete.

_______________	_______________	_______________
Date	Test Conductor	R&QA

6C.2 Annotate IETS tape "Start Orbit Sequence C Test, Para. 6C.2."

____

6C.3 Send sunset command.

_______________ H

6C.4 Verify visually and from IETS monitor that the instrument slews to initial position (Mode 3, xtask 0).

____

6C.5 Verify visually and from IETS monitor that instrument performs acquisition. Dump "Sun" screen entitled with paragraph number and record

Serial command 2 Value ______________ H

Time ______________

6C.6 Verify visually and from IETS monitor that instrument performs auto balance sequence (takes approximately 2 minutes, instrument goes to Mode 6, xtask 2).

____

6C.7 Verify visually and from IETS monitor that the instrument executes elevation scan cycles (Mode 6, xtask 3).

____

6C.8 Verify visually and from IETS monitor that instrument performs cal wheel sequence (Telemetry CS3 = 0, 1, 2,...11 and stops at 0, Mode 6, xtask 5 and 6).

____

6C.9 Verify instrument advances to Mode 6, xtask 8 for data period.

____

6C.10 Send annotate to IETS "Begin Drift Test #1, Para 6C.10" and immediately dump IETS "Sun" screen entitled with paragraph numbesr. Record the following telemetry values below.

TIME ______________

ELEV ______________ H

AZIM ______________ H

CSSAZ ______________ V

CSSEL ______________ V

CSSMAG ______________ V

FSSTOP ______________

FSSBOT ______________

Serial Command 2 ______________ H

6C.11 Verify the azimuth initial position register updated.

6C.11.1 Record serial command 2 value from Para. 6C.5.

_______________ H

6C.11.2 Verify this value is different from the value recorded in Para. 6C.10.

____

6C.12 After 15 1/2 minutes from time recorded in Para. 6C.10, send annotate to tape "End Drift Test #1, Para. 6C.12."

____

6C.13 Sunset will be terminated by updating the "Sunset Complete" intensity threshold register to its full scale value. This sets the trip intensity level to a value higher than the present value. To accomplish this, send serial command B000H.

____

6C.14 Verify data mode terminates and gimbals slew-to-stow (Mode 6, xtask 0).

____

6C.15 Verify from IETS monitor that instrument returns to "Telemetry Only," in Mode 0, xtask 0.

____

6C.16 Dump IETS "Sun" screen titled with paragraph number and record

TIME _______________

AZIM _______________ H

ELEV _______________ H

6C.17 Send annotate to tape "Complete Sunset C, Begin Sunrise C Test, Para. 6C.17."

6C.18 Verify UWY source intensity is off, but ready to be turned on.

____

6C.19 Send NEWGM command file to reinitialize intensity threshold.

____

6C.20 Dump IETS screen entitled with paragraph number and record the following values.

Serial Command 1 ______________ H

TIME ______________

6C.21 Send "sunrise" command and verify visually and by IETS monitor that gimbals slew from night stow to initial position (Mode 2, xtask 9).

____

6C.22 Verify visually and by IETS monitor that instrument performs acquisition (Mode 6, xtask AH).

____

6C.22.1 Turn up UWY source slowly to 70% and record source intensity setting when acquisition occurs (Mode 6, xtask AH).

Acquisition Intensity ______________

6C.23 Verify instrument advances to Mode 6, xtask 10 for data sequence.

____

6C.24 Dump IETS "Sun" screen entitled with paragraph number and record the values below:

ELEV ______________ H

AZIM ______________ H

CSSEL ______________ V

CSSAZ ______________ V

CSSMAG ______________ V

FSSTOP ______________

FSSBOT ______________

Serial Command 1 ______________

6C.25 Verify the azimuth initial position register updated.

6C.25.1 Record serial command 1 value from Para. 6C.20.

______________ H

6C.25.2 Verify this value is different from the value recorded in Para. 6C.24.

____

6C.26 The sunrise track sequence will be terminated by updating the "Sunrise Complete" elevation angle register to its soft limit value which causes the angular trip. Send command file "SRLTP".

____

6C.27 Verify track sequence is terminated by angular trip (Mode 6, xtask 12 and 13).

____

6C.28 Verify from IETS monitor that cal wheel sequence is performed (CS3 = 0, 1, 2... 11, and stops at 0).

____

6C.29 Verify visually and from IETS telemetry that instrument executes elevation scan cycles (Mode 6, xtask FH).

____

6C.30 Verify visually and from IETS monitor that instrument slews-to-day-stow (Mode 0, xtask 0).

____

6C.31 Verify instrument returns to "Telemetry Only" in Mode 0, xtask 0.

____

6C.32 Dump IETS "Sun" screen entitled with Para. No. and record the following values below.

TIME ________________

ELEV ________________ H

AZIM ________________ H

6C.33 Annotate IETS tape "End of Sunrise Test, Para. 6C.33."

____

6C.34 Since the day stow position was selected to coincide with the blackbody source position, the gimbals should now be within the acquisition field-of-view.

6C.35 Send command 0880H (coarse track) and wait a few seconds for azimuth and elevation errors to null within 0.1 volt. Now send 0800H followed by 0000H to place instrument in "Telemetry Only" mode (Mode 0, xtask 0).

____

6C.36 Prepare IETS tape annotate "Begin Drift Test #2, Para. 6C.36" but do not send yet.

____

6C.37 Record time of "Begin Drift Test #1" annotate from Para. 6C.10 and add 45 minutes.

Begin Drift Test #1 __________
+ 45 min

Begin Drift Test #2 __________

6C.38 Send annotate from Para. 6C.36 at proper time on IETS.

____

6C.39 After 15 1/2 minutes from time recorded in Para. 6C.37, send annotate to IETS tape "End Drift Test #2, Para. 6C.39."

____

6C.40 Turn off UWY source.

____

6C.41 Orbit Sequence C Test is complete.

Date	Test Conductor	R&QA

POST-TEST DATA ANALYSIS

6C.42 Plot Mode and xtask vs. time for sunset sequence and again for sunrise sequence.

____

6C.43 Compare plots to Figure 6A.48-1 for sunset and Figure 6A.48-2 for sunrise. Verify the following mode and xtask changes are correct.

Mode, xtask	Sunset	Sunrise
Slew-from-Stow	______	______
Acquisition	______	______
Time Delay	______	N.A.
Auto Balance	______	N.A.
Cal Wheel Step	______	______
Solar Scans	______	______
Data Sequence	______	______
Slew-to-Stow	______	______

6C.44 Drift Test

Run NEM analysis program beginning at tape annotate "Begin Drift Test #1" and again at annotate "Begin Drift Test #2." Correct the NEM (ppm) data to exoatmospheric intensity using the factors given. Complete the table below.

Parameter	HCl	HF	CH_4	NO
Correction Factor	2.96	5.09	3.38	3.24
NEM uncorrected				
NEM corrected				
15 min drift #1				
15 min drift #2				
*45 min drift				
V (1) avg				
V (2) avg				
DV (1) offset				
DV (2) offset				

* This value is calculated from the two 15 min. drift data sets.

6C.45 Dump raw data while instrument is in Mode 2, xtask 0 for sunset and Mode 3, xtask 9 for sunrise to determine sunset and sunrise initial positions. The times for the data dump can be obtained from the plots generated in Step 6C.42.

Initial Position	Sunset	Sunrise
Azim	______ H	______ H
Elev	______ H	______ H

6C.46 Fill out data sheet below. Compare actual values to set values where appropriate.

Parameters	**Set Value**	**Para.**	**Actual Value**	**Para.**	**Specification**
SUNSET					
Initial Position - ELEV		4C.7.4.1		6C.45	
Initial Position - AZIM		4C.7.4.1		6C.45	
Track Position - ELEV		4C.4.4		6C.10	
Track Position - AZIM		4C.4.4		6C.10	
CSSAZ				6C.10	
CSSEL				6C.10	
FSSTOP	125			6C.10	
FSSBOT	244			6C.10	
CSSMAG		4C.4.4		6C.10	
Night Stow Position-ELEV	+5 deg	4C.8.4		6C.16	
Night Stow Position-AZIM		4C.8.3		6C.16	
SUNRISE					
Initial Position - ELEV		4C.7.4.2		6C.45	
Initial Position - AZIM		4C.7.4.2		6C.45	
Track Position - ELEV		4C.5.5		6C.24	
Track Position - AZIM		4C.5.5		6C.24	
CSSAZ				6C.24	
CSSEL				6C.24	
FSSTOP	125			6C.24	
FSSBOT	244			6C.24	
CSSMAG		4C.5.5		6C.24	
Day Stow Position - ELEV		4C.8.5		6C.32	
Day Stow Position - AZIM		4C.8.5		6C.32	

6C.47 Plot the following data, with parameters listed together on same graph. Sunrise and sunset data will be plotted on separate graphs.

	Parameters	Sunset	Sunrise
1.	FSSBOT, FSSTOP	______	______
2.	CSSEL, CSSAZ, ELEV, AZIM	______	______
3.	HFAGC, HCLAGC, CH_4AGC, NOAGC	______	N.A.
4.	HFDAGC, HCLDAGC, CH_4AGC, NODAGC	______	N.A.
5.	HFV, HFDV	______	N.A.
6.	HFR, HFDR	______	N.A.
7.	HCLV, HCLDV	______	N.A.
8.	HCLR, HCLDR	______	N.A.
9.	CH_4V, CH_4DV	______	N.A.
10.	CH_4R, CH_4DR	______	N.A.
11.	NOV, NODV	______	N.A.
12.	NOR, NODR	______	N.A.

6C.48 Compare the data plots generated above to the baseline data set. Record anomalies.

____

6D.0 ORBIT SEQUENCE D TEST

This procedure is used to simulate sunset orbital operation of the instrument when no rate table is present and also provides radiometric measurements of initial offsets, 15 minute drift, and noise. This sequence is the lowest level of radiometric and gimbal testing. NOTE: The UWY source may be used, but no balance data or drift test data can be taken or analyzed. If the UWY source is used, the Sun sensor neutral density filter must be removed.

6D.1 Verify the test setup is complete.

6D.1.1 Source used is __________.

6D.1.2 Source is aligned __________.

6D.1.3 AGC switch set to "On" if GCETS connected.

____

6D.1.4 Send NEWGM command if necessary (read CAUTION at end of Para. 4D).

____

6D.1.5 Instrument Power-On and Initialization per Para. 4D is complete.

Date	Test Conductor	R&QA

6D.2 Annotate IETS tape "Start Orbit Sequence D Test."

____

6D.3 Send sunset command.

_______________ H

6D.4 Verify visually and from IETS monitor that the instrument slews to initial position (Mode 3, xtask 0).

____

6D.5 Verify visually and from IETS monitor that instrument performs acquisition. Dump "Sun" screen entitled with paragraph number and record

Serial command 2 Value _______________

Time _______________

6D.6 Verify visually and from IETS monitor that instrument performs auto balance sequence (takes approximately 2 minutes, instrument goes to Mode 6, xtask 2).

____

6D.7 Verify visually and from IETS monitor that the instrument executes elevation scan cycle (Mode 6, xtask 3).

____

6D.8 Verify visually and from IETS monitor that instrument performs cal wheel sequence (Telemetry CS3 = 0, 1, 2,...11 and stops at 0, Mode 6, xtask 5 and 6).

____

6D.9 Verify instrument advances to Mode 6, xtask 8 for data period.

____

6D.10 Send annotate to IETS "Begin 15 Minute Drift Test, Para. 6D.10" and immediately dump IETS "Sun" screen entitled with paragraph number. Record the following telemetry values below.

TIME ______________

ELEV ______________ H

AZIM ______________ H

CSSAZ ______________ V

CSSEL ______________ V

CSSMAG ______________ V

FSSTOP ______________

FSSBOT ______________

Serial Command 2 ______________ H

6D.11 Verify the azimuth initial position register updated.

6D.11.1 Record serial command 2 value from Para. 6D.5.

______________ H

6D.11.2 Verify this value is different from the value recorded in Para. 6D.10.

____

6D.12 After 15 1/2 minutes from time recorded in Para. 6D.10, send annotate to tape "End Drift Test, Para. 6D.12."

____

6D.13 Sunset will be terminated by updating the "Sunset Complete" intensity threshold register to its full scale value. This sets the trip intensity level to a value higher than the present value. To accomplish this, send serial command B000H.

____

6D.14 Verify data mode terminates and gimbals slew-to-stow (Mode 6, xtask 0).

____

6D.15 Verify from IETS monitor that instrument returns to "Telemetry Only," in Mode 0, xtask 0.

____

6D.16 Dump IETS "Sun" screen titled with paragaph number and record.

TIME ________________ AZIM ________________ H

ELEV ________________ H

6D.17 Send annotate to tape "Complete Sunset D Test, Para. 6D.17."

____

6D.18 Orbit Sequence D Test is complete.

____________	____________	____________
Date	Test Conductor	R&QA

POST-TEST DATA ANALYSIS

6D.19 Plot mode and xtask vs. time for sunset sequence and again for sunrise sequence.

____

6D.20 Compare plots to Figure 6A.48-1 for sunset and Figure 6A.48-2 for sunrise. Verify the following mode and xtask changes are correct.

Mode, xtask	**Sunset**
Slew-from-Stow	______
Acquisition	______
Time Delay	______
Auto Balance	______
Cal Wheel Step	______
Solar Scans	______
Data Sequence	______
Slew-to-Stow	______

6D.21 Drift Test

Run NEM analysis program beginning at tape annotate "Begin Drift Test." Correct the NEM (ppm) data to exoatmospheric intensity using the factors given. Complete the table below.

Parameter	**HCl**	**HF**	**CH_4**	**NO**
Correction Factor	2.96	5.09	3.38	3.24
NEM uncorrected				
NEM corrected				
Initial offset				
15 min drift #1				
V average				

6D.22 Dump raw data while instrument is in Mode 2, xtask 0 for sunset to determine initial position. The time for the data dump can be obtained from the plots generated in step 6D.19.

Initial Position	**Sunset**
Azim	______ H
Elev	______ H

6D.23 Fill out data sheet below. Compare actual values to set values where appropriate.

Parameters	Set Value	Para.	Actual Value	Para.	Specification
SUNSET					
Initial Position - ELEV		4D.6.4		6D.22	
Initial Position - AZIM		4D.6.4		6D.22	
Track Position - ELEV		4D.4.4		6D.10	
Track Position - AZIM		4D.4.4		6D.10	
CSSAZ				6D.10	
CSSEL				6D.10	
FSSTOP	125			6D.10	
FSSBOT	244			6D.10	
CSSMAG		4D.4.4		6D.10	
Night Stow Position-ELEV		4D.7.3		6D.16	
Night Stow Position-AZIM		4D.7.3		6D.16	

6D.24 Plot the following data, with parameters listed together on same graph.

Parameters	**Sunset**
1. FSSBOT, FSSTOP	______
2. CSSEL, CSSAZ, ELEV, AZIM	______
3. HFAGC, HCLAGC, CH_4AGC, NOAGC	______
4. HFDAGC, HCLDAGC, CH_4AGC, NODAGC	______
5. HFV, HFDV	______
6. HFR, HFDR	______
7. HCLV, HCLDV	______
8. HCLR, HCLDR	______
9. CH_4V, CH_4DV	______
10. CH_4R, CH_4DR	______
11. NOV, NODV	______
12. NOR, NODR	______

6D.25 Compare the data plots generated above to the baseline data set. Record anomalies.

____

7.0 SUN SENSOR BORESIGHT - ELEVATION TEST

This test verifies the Sun sensor to telescope optical/electrical elevation alignment. Sun sensor null to science channel field-of-view relationships are measured. Also, gimbal position and motor temperatures can be observed.

7.1 Verify the following:

7.1.1 Instrument is mounted to 90° bracket such that HALOE telescope second baffle can be aligned to rate table axis.

____

7.1.2 AGC switch is "On" if GCETS is used.

____

7.1.3 Source used is ____________________.

7.1.4 Turn room lights off in clean room.

____

7.1.5 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode" send command 0000H. If power is off, execute Paragraphs 3 and 4.

7.2 Annotate IETS TAPE "Begin Sun Sensor Boresight - Elevation Test, Para. 7.2."

____

7.3 Move elevation gimbal electrically and/or manually to align second baffle with rate table axis.

____

7.4 Move rate table and azimuth gimbal electrically and/or manually to align instrument to source.

____

7.5 Iterate Paragraphs 7.3 and 7.4 until second baffle is aligned to rate table axis and instrumet is aligned to source such that CSSAZ and CSSEL are within ± 0.1 volt on IETS monitor using "SUN" screen.

Verify aligned ________________

7.6 Dump printout of "SUN" IETS screen entitled "El Boresight - Para. 7.6." Record.

AZIM ______________ H

ELEV ______________ H

Rate Table Position ______________ deg

7.7 Rotate rate table -0.4 deg (CCW).

____

7.8 Annotate IETS disk and tape "Begin Elevation Scan, Para. 7.8."

____

7.9 Start recording data to hard disk.

____

7.10 Start rate table at 0.01 deg/sec immediately after dumping IETS "SUN" screen entitled with Para. no. and record.

Time ______________

7.11 After 80 seconds have elapsed, stop rate table and disk data system (this should provide 0.8 degree of rotation).

____

7.12 Annotate IETS tape "End SS Boresight - El Test, Para. 7.12."

____

7.13 The Sun Sensor Boresight - Elevation Test is complete.

______________ ______________ ______________
Date Test Conductor R&QA

POST TEST DATA ANALYSIS

7.14 Use disk data to plot CSSEL and CH4V with time in high resolution plot mode and on same graph beginning at time recorded in Para. 7.10.

____

7.15 Determine time of null crossing.

Time ______________

7.16 On separate graphs, plot FSSTOP and FSSBOT with time (in high resolution plot mode), with start and stop times -10 seconds and +10 seconds, respectively, from the time determined in Para. 7.15.

____

7.17 Verify FSSBOT-FSSTOP = 119 ±1 when CSSEL = null ±5 arcminute.

FSSBOT - FSSTOP = __________

7.18 Record FSSTOP at CSSEL = null.

FSSTOP __________

8.0 IFOV, ELEVATION TEST

This test is used for optical performance verification during Level I testing. The instrument must be mounted to the 90° bracket for this test. Configure GCETS data system as given in Figure 8-1.

8.1 Verify the following:

8.1.1 GCETS connected: _______________

CAUTION: Instrument power must be off to connect GCETS.

8.1.2 The GCETS AGC switch is set to "OFF" _______________.

8.1.3 GCETS data system ready: _______________

8.1.4 Instrument is mounted to the 90° bracket on rate table.

____

8.1.5 Slit is installed for elevation scan: _______________

8.1.6 Source is 3000°K blackbody: _______________.

8.1.7 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode," send command 0000H. If power is off, execute Para. 3.0.

8.2 Align instrument to the 3000°K blackbody radiometric source so that the image of the blackbody exit aperture formed by the HALOE telescope is centered with the field stop. Record the following data

AZIM _______________ H

ELEV _______________ H

Rate Table Position _______________ deg

8.3 Locate the image of the slit above the field stop aperture 0.010-inch. Record the micrometer position. This will be the starting point of the scan.

Starting point _______________

8.4 Verify that the GCETS AGC switch is set to "off" (AGC inactive).

____

DATA CHANNEL NO.	MEASUREMENT
0	HCLGAS
1	HCLVAC
2	CH4GAS
3	CH4VAC
4	NOGAS
5	NOVAC
6	HFGAS
7	HFVAC
8	H2OV
9	NO2V
10	CO2V
11	O3V
12	SPARE 1
13	SPARE 2
14	Standard Detector
15	Shorting Plug

Figure 8-1 Configuration of GCETS Data System

8.5 Annotate the IETS tape "Start IFOV, El Test, Para. 8.5."

Record the starting time ______________

8.6 Annotate the GCETS data system and IETS tape with the micrometer starting point of scan (Paragraph 8.3) and record one minute of data (120 samples).

Starting point ______________

8.7 Advance the scan fixture 0.002-inch and annotate the IETS tape and GCETS data system with the new micrometer position, and record one minute of data.

____

8.8 Repeat 8.7 until 30 data points have been recorded, updating the micrometer reading and recording one minute of data. Annotate the GCETS data system and IETS tape with updated micrometer position before taking the data.

____

8.9 Remove slit apparatus.

____

8.10 Record one minute of data annotated on GCETS data system and IETS tape with "Full FOV Data, Para. 8.10."

____

8.11 Annotate IETS tape "End of IFOV El Test, Para. 8.11."

____

8.12 The IFOV, El Test is complete.

______________	______________	______________
Date	Test Conductor	R&QA

POST-TEST DATA ANALYSIS

8.13 Do statistical analysis of data. Record 1 sigma noise for V-vacuum and V-gas for each of the gas correlation channels and for V for each of the radiometer channels.

Channel	Vac Noise	Gas Noise
HF	________	________
HCl	________	________
CH_4	________	________
NO	________	________
CO_2	________	N.A.
H_2O	________	N.A.
NO_2	________	N.A.
O_3	________	N.A.

8.14 Plot the following data, with parameters listed together on same graph.

Graph	
HFV-vac, HFV-gas	________
HClV-vac,HClV-gas	________
CH_4V-vac, CH_4V-gas	________
NOV-vac, NOV-gas	________
CO_2	________
H_2O	________
NO_2	________
O_3	________

8.15 Compare plots to baseline data set and record any anomalies between sets.

____

9.0 GIMBAL RANGE TEST

This test verifies the azimuth and elevation gimbal hard and soft stop positions. In addition, gimbal angular travel and slew rates are verified. The instrument must be mounted vertically to run this test. It will be run during all Level 1, 2, 3 testing when gimbals are not caged.

9.1 Verify the following

9.1.1 Instrument is mounted vertically _______________.

9.1.2 GCETS is disconnected _______________.

9.1.3 Instrument is "On" In "Telemetry Only" mode.

____

9.1.4 Send command file "GIMDEF" _______________.

NOTE: If in "Test Mode," send command 0000H. If power is off, execute Para. 3.0.

9.2 Annotate IETS tape "Begin Gimbal Range Test, Para. 9.2."

____

9.3 Perform the following memory reset by sending command file "GIMAZ."

____

9.3.1 Sunrise Initial Azimuth (+190 deg) 013EH

9.3.2 Sunrise Initial Elevation (-0.25 deg) 500H

9.3.3 Sunset Initial Azimuth (-190 deg) OEC1H

9.3.4 Sunset Initial Elevation (-0.25 deg) 500H

9.3.5 CSS Sunrise Threshold (max to disable) 0000H

9.3.6 CSS Sunset Threshold (max to disable) 0000H

9.4 Send command SUNRISE _______________

9.5 After Az gimbal has reached its soft limit, dump IETS monitor "SUN" screen titled "Az Gimbal soft limits - pos., Para. 9.5."

____

9.6 From printout, record Az gimbal soft limit - positive values.

AZIM _______________ H

C-2

9.7 Verify the positive soft limit.

AZIM = 016CH ± 4H ________________

9.8 Manually move and hold the azimuth gimbal against the hard stop while the IETS monitor "SUN" screen is dumped, titled "Az Gimbal Hard Stop - Positive."

____

9.9 From screen printout record Az gimbal hard stop-positive value.

AZIM ________________ H

9.10 Verify the positive hard stop position.

AZIM = 013EH ± 4H ________________

9.11 Annotate IETS tape and hard disk "Begin Az Slew Test" and start recording data to disk. Record

Time ________________

9.12 Send command SUNSET.

TIME ________________

9.13 After gimbal has stopped, stop recording data to IETS disk. Record

Time ________________

9.14 Dump IETS "SUN" screen entitled with "Az gimbal soft limit - negative, Para. 9.14" and record

TIME ________________

9.15 Annotate IETS tape "End of Az Slew Test."

____

9.16 From screen dump in Para. 9.14, record the negative soft limit value.

AZIM ________________ H

9.17 Verify the following negative soft limit.

AZIM = 0E93H ± 4H ________________

9.18 Manually move and hold the azimuth gimbal against the hard stop while the IETS screen "SUN" is dumped, entitled "Az gimbal hard stop - negative, Para. 9.18."

____

9.19 From screen printout, record the gimbal hard stop - negative value.

AZIM ________________ H

9.20 Verify the following negative hard stop position.

AZIM = 0EC1H ± 10H ________________

9.21 Annotate IETS tape "End of Az Gimbal Range Test, Para. 9.25."

____

9.22 From disk data plot AZIM beginning at annotate Para. 9.11 and ending with Para. 9.13. The time is about 6 1/2 minutes.

____

9.23 Perform the following memory reset by sending command file "GIMEL."

____

9.23.1 Sunrise Initial Azimuth (0 deg) 7FFH

9.23.2 Sunrise Initial Elevation (+11 deg) 00E9H

9.23.3 Sunset Initial Azimuth (0 deg) 7FFH

9.23.4 Sunset Initial Elevation (-28 deg) 0F1CH

9.23.5 CSS Sunrise Threshold (max to disable) 0000H

9.23.6 CSS Sunset Threshold (max to disable) 0000H

9.24 Send command SUNRISE ________________

9.25 After El gimbal has reached its soft limit, dump IETS monitor "SUN" screen titled "El Gimbal soft limits - positive, Para. 9.25."

____

9.26 From printout, record El gimbal soft limit - positive values.

ELEV ________________ H

9.27 Verify the positive soft limit.

ELEV = 0146H ± 20H ______________

9.28 Manually move and hold the elevation gimbal against the hard stop while the IETS monitor "SUN" screen is dumped, titled "El gimbal hard stop - positive, Para. 9.28."

____

9.29 From screen printout record El gimbal hard stop-positive value.

ELEV ______________ H

9.30 Verify the positive hard stop position.

ELEV = 00E9H ± 10H ______________

9.31 Annotate IETS tape and hard disk "Begin El Slew Test, Para. 9.31" and start recording data to disk. Record

Time ______________

9.32 Send command SUNSET.

____

9.33 After the gimbal has stopped, stop recording data to IETS disk. Record

Time ______________

9.34 Dump IETS "SUN" screen entitled with "El gimbal soft limit - negative, Para. 9.34," and record

TIME ______________

9.35 Annotate IETS tape "End of El Slew Test, Para. 9.35."

____

9.36 From screen dump in Para. 9.34, record the negative soft limit value.

ELEV ______________ H

9.37 Verify the following negative soft limit.

ELEV = 0EB9H ± 10H ______________

9.38 Manually move and hold the elevation gimbal against the hard stop while the IETS screen "SUN" is dumped, entitled "El gimbal hard stop - negative, Para. 9.38."

____

9.39 From screen printout, record the gimbal hard stop - negative value.

ELEV ________________ H

9.40 Verify the following negative hard stop position.

ELEV = 0F16H ± 10H ________________

9.41 Annotate IETS tape "End of El Gimbal Range Test, Para. 9.41."

____

9.42 From disk data, plot ELEV beginning at annotate Para. 9.31 and ending with the time recorded in Para. 9.33.

____

9.43 Verify plots indicate no anomalous behavior ________________

9.44 Calculate slew rates (slope of line) and record below. (Scale factor is 4.4 deg/V for El and 45 deg/V for Az).

ELEV slew rate ______________

AZIM slew rate ________________

9.45 Verify slew rates are 1.08 deg/sec ± .01.

ELEV ________________

AZIM ________________

9.46 Send command file NEWGM to re-initialize the instrument.

____

10.0 LINEARITY TEST

This test is run to verify detector and data system performance during Level I testing. The instrument must be mounted vertically to run this test. Normally, one-minute data periods are used at each knife edge position. However, a five-minute data period must be used once during test program. Configure GCETS data system as given in Figure 8-1.

10.1 Verify the following:

10.1.1 GCETS connected: ________________
CAUTION: Instrument power must be turned off to connect GCETS.

10.1.2 GCETS data system ready: ________________

10.1.3 Instrument is mounted vertically: ________________

10.1.4 Knife edge is set for elevation scan: ________________

10.1.5 Source is 3000°K blackbody: ________________

10.1.6 Si. Std. detector is aligned: ________________

10.1.7 Si. Std. detector output is connected to data system.

____

10.1.8 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode," send command 0000H. If power is off, execute Para. 3.0.

10.1.9 Data period ( ) 1 min; ( ) 5 min.

10.2 Align instrument to 3000°K blackbody source so that the image of the blackbody exit aperture formed by the HALOE telescope is centered with the field stop. Record

AZIM ________________ deg

ELEV ________________ deg

Rate Table Position ________________ deg

10.3 Locate the image of the knife edge above the field stop aperture 0.025-inch. Record the micrometer position. This will be the starting point of the scan.

Starting point ________________

10.4 Verify that the GCETS AGC switch is set to "off" (AGC inactive).

____

10.5 The data taking interval should be identical on the GCETS and IETS, and data sets will occur simultaneously. Annotate the IETS tape and GCETS data system with "Start Linearity Test, Para. 10.5."

Record the starting time ______________

10.6 Annotate IETS tape and GCETS data system with the micrometer starting point of scan (Paragraph 10.3) and record 1 min (5 min) of data. Micrometer positions are recorded in "STATUS 2" on the IETS.

Starting point ______________

10.7 Advance the scan fixture 0.005-inch and annotate the IETS tape and GCETS data system with the new micrometer position, and record 1 min (5 min) of data.

____

10.8 Repeat 10.7 until the field stop is totally obscured updating micrometer reading and recording 1 min (5 min) of data. Annotate IETS tape and GCETS data system with up-dated micrometer position before taking data.

____

10.9 Annotate the IETS tape with "End of Linearity Test, Para. 10.9."

____

10.10 Linearity Test is completed.

______________	______________	______________
Date	Test Conductor	R&QA

POST TEST DATA ANALYSIS

10.11 Do statistical analysis of GCETS data to provide V mean and std. dev. at each micrometer position. Record one sigma noise for V-vacuum and V-gas for each of the gas correlation channels in the table below.

Channel	Vac Noise	Gas Noise
HF		
HCl		
CH_4		
NO		
CO_2		N.A.
H_2O		N.A.
NO_2		N.A.
O_3		N.A.

10.12 Plot the following V data vs. Si std. detector output, with parameters listed together on same graph.

Graph	
HFV-vac, HFV-gas	
HClV-vac,HClV-gas	
CH_4V-vac, CH_4V-gas	
NOV-vac, NOV-gas	
CO_2	
H_2O	
NO_2	
O_3	

10.13 Compare plots to baseline data set and record any anomalies between sets.

____

11.0 SUN SENSOR BORESIGHT - AZIMUTH TEST

This test verifies the Sun sensor to telescope optical/electrical azimuth alignment. Sun sensor null to science channel field-of-view relationships are measured. Also, gimbal position and motor temperatures can be observed.

11.1 Verify the following:

11.1.1 Instrument is mounted vertically such that HALOE telescope second baffle can be aligned to rate table axis.

____

11.1.2 AGC switch is "On" if GCETS is used.

____

11.1.3 Source used is ____________________.

11.1.4 Turn room lights off in clean room.

____

11.1.5 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode" send command 0000H. If power is off, execute Paragraphs 3 and 4.

11.2 Annotate IETS TAPE "Begin Sun Sensor Boresight - Azimuth Test."

____

11.3 Move azimuth gimbal electrically and/or manually to align second baffle with rate table axis.

____

11.4 Move rate table and elevation gimbal electrically and/or manually to align instrument to source.

____

11.5 Iterate Paragraphs 11.3 and 11.4 until second baffle is aligned to rate table axis and instrument is aligned to source such that CSSAZ and CSSEL are within ± 0.1 volt on IETS monitor using "SUN" screen. Send command 08A0H to place instrument in fine track mode and verify

FSSTOP = 125 ± 1 ________________

11.6 Send command 0800H followed by 0000H to place instrument in "telemetry only" mode. Then dump printout of "SUN" IETS screen entitled "Az Boresight - Para. 11.6." Record

AZIM _______________ H

ELEV _______________ H

Rate Table Position _______________ deg

11.7 Rotate rate table -0.4 deg (CCW).

____

11.8 Annotate IETS disk and tape "Begin azimuth scan, Para. 11.8."

____

11.9 Start recording data to hard disk.

____

11.10 Start rate table at 0.01 deg/sec immediately after dumping IETS "SUN" screen entitled with Para. no. and record.

Time _______________

11.11 After 80 seconds have elapsed, stop rate table and disk data system (this should provide 0.8 degree of rotation).

____

11.12 Annotate IETS tape "End Sun SS Boresight - Az Test Para. 11.12."

____

11.13 The Sun Sensor Boresight - Azimuth Test is complete.

_______________	_______________	_______________
Date	Test Conductor	R&QA

POST TEST DATA ANALYSIS

11.14 Use disk data to plot CSSEL and CH4V with time in high resolution plot mode and on same graph beginning at time recorded in Para. 11.10.

____

11.15 Determine time of null crossing.

Time _______________

11.16 On separate graphs, plot FSSTOP and FSSBOT with time (in high resolution plot mode), with start and stop times -10 seconds and +10 seconds, respectively, from the time determined in Para. 11.15.

____

11.17 Verify FSSBOT-FSSTOP = 119 ±1 when CSSAZ = null ±1 arcminute.

FSSBOT - FSSTOP = __________

11.18 Record FSSTOP at CSSAZ = null.

FSSTOP __________

12.0 IFOV, AZ TEST

This test is used to verify optical performance integrity during Level I testing. The instrument must be mounted vertically for this test. Configure GCETS data system as given in Figure 8-1.

12.1 Verify the following:

12.1.1 GCETS connected: ________________
CAUTION: Instrument power must be off the connect GECTS.

12.1.2 The GCETS AGC switch is set to "Off": ________________

12.1.3 GCETS data system ready: ________________

12.1.4 Instrument is mounted vertical: ________________

12.1.5 Slit is installed for azimuth scan: ________________

12.1.6 Source is 3000°K blackbody: ________________

12.1.7 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode" send command 0000H. If power is off, execute Para. 3.0.

12.2 Align instrument to 3000°K blackbody source such that the image of the blackbody exit aperture formed by the HALOE telescope is centered with the field stop. Record the following data

AZIM ________________ H

ELEV ________________ H

Rate Table Position ________________ deg

12.3 Locate the image of the slit above the field stop aperture 0.050-inch. Record the micrometer position. This will be the starting point of the scan.

Starting point ________________

12.4 Verify that the GCETS AGC switch is set to "off" (AGC inactive).

____

12.5 Annotate the IETS tape "Start IFOV, Az Test, Para. 12.5."

Record the starting time ________________

12.6 Annotate the GCETS data system and IETS tape with the micrometer starting point of scan (Paragraph 12.3) and record one minute of data (120 samples).

Starting point ________________

12.7 Advance the scan fixture 0.010-inch and annotate the IETS tape and GCETS data system with the new micrometer position, and record one minute of data.

____

12.8 Repeat 12.7 until 24 data points have been recorded, updating the micrometer reading and recording one minute of data. Annotate the GCETS data system and IETS tape with updated micrometer position before taking the data.

____

12.9 Remove slit apparatus.

____

12.10 Record one minute of data annotated on IETS tape and GCETS data system with "Full FOV Data, Para. 12.10."

____

12.11 Annotate IETS tape "End of IFOV Az Test, Para. 12.11."

____

12.12 The IFOV, Az Test is complete.

________________	________________	________________
Date	Test Conductor	R&QA

POST-TEST DATA ANALYSIS

12.13 Do statistical analysis of data. Record 1 sigma noise for V-vacuum and V-gas for each of the gas correlation channels and for V for each of the radiometer channels.

Channel	Vac Noise	Gas Noise
HF		
HCl		
CH_4		
NO		
CO_2		N.A.
H_2O		N.A.
NO_2		N.A.
O_3		N.A.

12.14 Plot the following data, with parameters listed together on same graph.

Graph	
HFV-vac, HFV-gas	
HClV-vac,HClV-gas	
CH_4V-vac, CH_4V-gas	
NOV-vac, NOV-gas	
CO_2	
H_2O	
NO_2	
O_3	

12.15 Compare plots to baseline data set and record any anomalies between sets.

____

13.0 CAL WHEEL TEST A (1 Min/Port)

This test is to continue (from characterization testing) trending data through all cal wheel ports using an interval of 1 minute per port. The manual balance sequence is used so that balance health can be monitored. The instrument can have any orientation. This test should be run for all levels of testing that require a blackbody source.

13.1 Verify the following:

13.1.1 The GCETS does not have to be connected. However, AGC switch must be set to "On" if GCETS is connected.

____

13.1.2 Source is 3000°K blackbody.

____

13.1.3 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode" send command 0000H. If power is off execute Para. 3.0.

13.2 Align instrument to the 3000°K blackbody source so that the image of the blackbody exit aperture formed by the HALOE telescope is centered with the field stop. The instrument may be aligned by manually and/or electrically turning rate table and gimbals. Record

AZIM ________________ H

ELEV ________________ H

Rate Table Position ________________ deg

13.3 Verify source is adjusted to 2365°F.

____

13.4 Annotate tape "Start Cal A Test, Para. 13.4."

____

13.5 Perform Gas Channel Manual Balance

13.5.1 Annotate tape "Start Gas Channel Manual Balance, Para. 13.5.1."

____

13.5.2 Perform manual balance sequence. Record the following data for the last DAC update commands sent.

Channel	HF	HCl	CH_4	NO
DAC	______	______	______	______
Delta V	______	______	______	______
AGC	______	______	______	______

13.5.3 Annotate IETS tape "End of Balance, Para. 13.5.3."

____

13.6 Dark Data #1

13.6.1 Annotate IETS tape and disk "Dark Data, Para. 13.6.1."

____

13.6.2 Block blackbody beam to instrument. Allow 2 min. for AGC loop to stabilize. Then, use stop watch to record 2 minutes data.

____

13.6.3 Annotate IETS tape "End of Dark Data #1, Para. 13.6.3" and unblock beam.

____

13.7 Open Port Data #1

13.7.1 Annotate IETS tape and disk "Begin Open Port Data #1, Para. 13.7.1."

____

13.7.2 Allow 2 min. for AGC loop to stabilize. Then, use stop watch to record 2 minutes data.

____

13.7.3 Annotate IETS tape "End of Open Port Data #1, Para. 13.7.3."

____

13.8 1 Minute Manual Step

13.8.1 Annotate IETS tape and disk "Cal Wheel Data, Para. 13.8.1."

____

13.8.2 Send command file CALTRN.

____

13.8.3 Observe telemetry (CS3) to verify cal wheel advances from 0, 1, 2, ... 11 and stops at 0 with 1 minute per port dwell times.

____

13.8.4 Annotate tape "End Cal Wheel Data, Para. 13.8.4" when CS3 = 0.

____

13.9 Open Port Data #2

13.9.1 Annotate IETS tape and disk "Begin Open Port Data #2, Para. 13.9.1."

____

13.9.2 Allow 2 minutes after last cal wheel step for AGC to stabilize. Then, use stop watch to record 2 minutes data.

____

13.9.3 Annotate IETS tape "End of Open Port Data #2, Para. 13.9.3."

____

13.10 Dark Data #2

13.10.1 Annotate IETS tape and disk "Begin Dark Data #2, Para. 13.10.1" and block beam.

____

13.10.2 Allow 2 min. for AGC to stabilize. Then, use stop watch to record 2 minutes data.

____

13.10.3 Annotate IETS tape "End of Cal A Test, Para. 13.10.3."

____

POST-TEST DATA ANALYSIS

13.11 Send copy of data tape and annotate listing to Science Team for analysis.

____

13.12 Review DAC and DV data to determine if DAC values are approaching the limit of the DAC range.

____

14.0 CAL WHEEL TEST B (7.5 SEC/PORT)

This test will characterize AGC time constant effects on cal wheel data. The automatic mode flight software subroutine is used to step the cal wheel, dwelling at each port for 7.5 sec. The automatic mode balance sequence is also performed. Fifteen cal wheel revolutions are performed for statistical purposes.

14.1 Verify the following:

14.1.1 The GCETS does not have to be connected. However, AGC switch must be set to "On" if GCETS is connected.

____

14.1.2 Source is 3000°K blackbody.

____

14.1.3 Instrument is "On" in "Telemetry Only" mode.

____

NOTE: If in "Test Mode" send command 0000H. If power is off execute Para. 3.0.

14.2 Align instrument to the 3000°K blackbody source so that the image of the blackbody exit aperture formed by the HALOE telescope is centered with the field stop. The instrument may be aligned by manually and/or electrically turning rate table and gimbals. Record

AZIM ________________ H

ELEV ________________ H

Rate Table Position ________________ deg

14.3 Verify source is adjusted to 2365°F.

____

14.4 Annotate tape "Start Cal B Test, Para. 14.4."

____

14.5 Perform Gas Channel Auto Balance.

14.5.1 Annotate tape "Start Gas Channel Auto Balance, Para. 14.5.1."

____

14.5.2 Send command 0900H.

____

14.5.3 Wait for several minutes while DVs are being balanced.

____

14.5.4 When DVs are balanced, send command 0000H.

____

14.5.5 Wait until Mode 0 xtask 2 advances to Mode 0 xtask 3 (may require 2 minutes).

____

14.5.6 Send command 0800H followed by 0000H to put instrument back into "Telemetry Mode."

____

14.5.7 Annotate IETS tape "End of Auto Balance, Begin Cal Wheel Sequence, Para. 14.5.7."

____

14.6 Cal Wheel B Sequence

14.6.1 Annotate IETS tape with Run No.

____

14.6.2 Shutter beam to instrument, and allow 2 min. for AGC loop to stabilize. Then, record 3 min. data using stop watch for timing.

____

14.6.3 Open shutter and allow 2 min. for AGC to stabilize. Then, record 3 min. data using stop watch for timing.

____

14.6.4 Send command F051H followed by 0404H to place instrument in Mode 0 xtask 6.

____

14.6.5 Monitor telemetry channel CS 3 and verify it steps from 0, 1, 2, ... 11 and back to 0, dwelling 7.5 seconds at each port.

____

14.6.6 When CS 3 = 0, allow 2 min. for AGC to stabilize. Then, use stop watch to record 3 minutes data.

____

14.6.7 Send command 0800H followed by 0000H.

____

14.6.8 Repeat Steps 14.6.1 - 14.6.7 fifteen times.

____

14.6.9 Annotate IETS "End of Cal B Test, Para. 14.6.9."

____

POST-TEST DATA ANALYSIS

14.7 Send copy of tape and annotate listing to Science Team for analysis.

15.0 SOLAR HEATING/SELF-THERMAL EMISSIONS TEST

This test measures the instrument's ability to dump heat caused by out-of-field exoatmospheric solar energy, and recovery to low level background self-thermal emissions when pointed away from the Sun. This test will only be run during the Thermal-Vacuum Test, and will employ the AMO solar simulator. This paragraph requires instrument initialization per Para. 4C.

15.1 Verify the following.

15.1.1 The AMO Solar Simulator is aligned to the instrument.

____

15.1.2 Instrument initialization per Para. 4C.0 is complete.

____

15.1.3 Send NEWGM command if necessary (read CAUTION at end of Para. 4C).

____

15.1.4 The Portable Stimulus Test Set is on.

____

15.1.5 Instrument is on in "Telemetry Only" mode.

____

NOTE: If in "Test Mode," send command 0000H. If power is off, execute Para. 3.0.

15.2 Turn AMO Solar Simulator "on" per its operation manual procedures.

____

15.3 Annotate IETS tape "Begin Solar Heating/Self-Thermal Emissions Test, Para. 15.3."

____

15.4 This test requires that instrument gimbals slew to three positions: (1) the blackbody source, (2) the AMO solar simulator, and (3) a cold wall location. This will be accomplished by updating the day stow position register before each gimbal slew. Record these positions below.

15.4.1 Blackbody Position (from Para. 4C.4.4)

AZIM ________________ H

ELEV ________________ H

15.4.2 AMO Solar Simulator Position (from Para. 4C13.3) AZIM ________________ H

ELEV ________________ H

15.4.3 Cold Wall Position (from Para. 4C.12.2) AZIM ________________ H

ELEV ________________ H

NOTE: The NEWGM command file initializes the instrument to point toward the blackbody.

15.5 Balance Instrument

Perform an instrument auto-balance using the blackbody as the source.

15.5.1 Send command 08E0H to slew gimbals to blackbody position.

____

15.5.2 Send command 0880H (coarse track) and wait a few seconds for CSSAZ to null within 0.1 volt.

____

15.5.3 Send command 08C0H (fine track) and wait for FSSTOP = 125 ± 1.

____

15.5.4 Send command 0800H followed by 0000H to place instrument in "Telemetry Only" mode.

____

15.5.5 Annotate IETS tape "Balance Sequence, Para. 15.5.5". Then send command 0900H and wait for several minutes while DVs are being balanced.

____

15.5.6 When DVs are balanced, send command 0000H and wait for xtask 2 to advance to xtask 3 (Mode 0). This may require 2 minutes.

____

15.5.7 Send command 0800H followed by 0000H to place instrument in "Telemetry Only" mode.

____

15.5.8 Annotate IETS tape "Begin Drift Test Run #1, Para. 15.5.8" and record time.

TIME ________________

15.5.9 After 15 1/2 minutes have elapsed, annotate IETS tape "End Drift Test Run #1, Para. 15.5.9."

____

15.6 Slew to Cold Wall

15.6.1 Send commands 3XXXH and DYYYH where XXX and YYY are the respective azimuth and elevation hexidecimal positions recorded in Para. 14.4.3.

____

15.6.2 Send command 080E0H ________________.

15.6.3 Verify gimbals slew to cold wall position.

____

15.6.4 Annotate IETS tape "Begin Cold Wall Run #1, Para. 15.6.4."

____

15.6.5 Dump IETS "DEWEY" screen every 5 minutes.

____

15.6.6 After 15 1/2 minutes have elapsed, annotate IETS tape "End of Cold Wall Run #1, Para. 15.6.6."

____

15.7 Slew-to-AMO Solar Simulator

15.7.1 Send command 3XXXH and DYYYH where XXX and YYY are the respective azimuth and elevation hexidecimal positions recorded in Para. 15.4.2.

____

15.7.2 Send command 08E0H ________________.

15.7.3 Verify gimbals slew to the AMO solar simulator.

____

15.7.4 Send command 0880H (coarse track) and wait for CSSAZ to null within 0.1 volt.

____

15.7.5 Annotate IETS tape "Begin Solar look Run #1, Para. 15.7.5."

____

15.7.6 Dump IETS "DEWEY" screen every 5 minutes.

____

15.7.7 After 30 minutes have elapsed, annotate IETS tape "End Solar Look Run #1, Para. 15.7.7."

____

15.8 Slew Back to Cold Wall

15.8.1 Send the same 3XXXH and DYYYH day stow position update commands as was sent in Para. 15.6.1.

____

15.8.2 Send command 08E0H ________________.

15.8.3 Verify gimbals slew back to cold wall.

____

15.8.4 Annotate IETS tape "Begin Cold Wall Run #2, Para. 15.8.4."

____

15.8.5 Dump IETS "DEWEY" screen every 5 minutes.

____

15.8.6 When temperatures have stabilized on the IETS "DEWEY" screen (no monitor changing at a faster rate than 0.5 deg in 10 min), send annotate to IETS tape "End Cold Wall Run #2, Para. 15.8.6."

____

15.9 Slew Back to AMO Solar Simulator

15.9.1 Send the same 3XXXH and DYYYH day stow position update commands as was sent in Para. 15.7.1.

____

15.9.2 Send command 08E0H _______________.

15.9.3 Verify gimbals slew to the AMO solar simulator.

____

15.9.4 Send comand 0880H (coarse track) and wait for CSSAZ to null within 0.1 volt.

____

15.9.5 Annotate IETS tape "Begin Solar Look Run #2, Para. 15.9.5."

____

15.9.6 Dump IETS "DEWEY" screen every 5 minutes.

____

15.9.7 After 30 minutes have elapsed, annotate IETS tape "End Solar Look Run #2, Para. 15.9.7."

____

15.10 Slew Back to Blackbody

15.10.1 Send NEWGM command file _______________

15.10.2 Send command 08E0H _______________.

15.10.3 Verify gimbals slew back to blackbody position.

____

15.10.4 Send command 0880H (coarse track) and wait a few seconds for CSSAZ to null within 0.1 volt.

____

15.10.5 Send command 08C0H (fine track) and wait for FSSTOP = 125 ± 1.

____

15.10.6 Send command 0800H followed by 0000H to place instrument in "Telemetry Only" mode.

____

15.10.7 Annotate IETS tape "Begin Drift Test Run #2, Para. 15.10.7" and record time.

TIME _______________

15.10.8 Dump IETS "DEWEY" screen every 3 minutes.

____

15.10.9 After 15 1/2 minutes have elapsed, annotate IETS tape "End Drift Test Run #2, Para. 15.10.9."

____

15.10.10 Solar Heating/Self Thermal Emissions Test is complete.

________________ ________________ ________________
Date Test Conductor R&QA

POST-TEST DATA ANALYSIS

15.11 Plot selected temperature telemetry channels which are TBD.

15.12 Run NEM analysis program beginning at tape annotate "Begin Drift Test #1" and again at annotate "Begin Drift Test #2." Correct the NEM (ppm) data to exoatmospheric intensity using the factors given. Complete the table below.

Parameter	HCl	HF	CH_4	NO
Correction Factor	2.96	5.09	3.38	3.24
NEM uncorrected				
NEM corrected				
15 min drift #1				
15 min drift #2				
*45 min drift				
V (1) avg				
V (2) avg				
DV (1) offset				
DV (2) offset				

* This value is calculated from 15 min. data sets.

15.13 Send copy of data tape and annotate listing to Science for further analysis.

16.0 HEALTH TEST

The objective of this test is to verify instrument health. This is accomplished by commanding the gimbals to slew through their range and dumping IETS screens that contain critical voltage, current, and temperature telemetry. This test may be performed anytime but is specifically designed to be used during thermal-vacuum testing. No radiometric source will be needed for this test. Also, Para. 4 - Initilization is not a prerequisite for performing this test.

16.1 Verify that instrument is "on" in "Telemetry Only" mode.

NOTE: If in "Test Mode," send command 0000H. If power is off, execute Para. 3.0.

____

CAUTION: This paragraph does not require instrument initialization via the NEWGM command. However, if other tests follow this test that do require initialization, then send the NEWGM command before proceeding with these tests.

16.2 Annotate IETS tape "Begin Health Test, Para. 16.2."

____

16.3 Perform the following memory reset by sending command file "GRINC."

____

Sunrise Initial Azimuth (+190 deg) 013EH

Sunrise INITial Elevation (+11 deg) 00E9H

Sunset Initial Azimuth (-190 deg) 0EC1H

Sunset Initial Elevation (-28 deg) 0F16H

CSS Sunrise Thereshold (max to disable) 0000H

CSS Sunset Threshold (max to disable) 0000H

16.4 Send command SUNRISE.

____

16.5 Verify visually that instrument slews to the sunrise initial position (Mode 2, xtask 9).

____

16.6 Dump IETS "Sun" screen and verify gimbals reached their soft stops.

____

16.7 Dump IETS "Health" screen and verify critical telemetry data is within range.

____

16.8 Send command SUNSET.

____

16.9 Verify visually that instrument slews to the sunset initial position (Mode 3, xtask 0).

____

16.10 Dump IETS "Sun" screen and verify gimbals reached their soft stops.

____

16.11 Dump IETS "Health" screen and verify critical telemetry data is within range.

____

16.12 If other tests follow this test, reinitialize instrument by sending command NEWGM.

____

16.13 If gimbals are left in an undesirable position (for example, pointed toward cold wall during the Thermal-Vacuum Test), send command 08E0H to put gimbals in "day stow" position. After gimbals reach the day stow position, send command 0800H followed by 0000H.

____

16.14 Annotate IETS tape "End of Health Test, Para. 16.14."

____

16.15 Health Test is complete.

________________	________________	________________
Date	Test Conductor	R&QA

POST TEST DATA ANALYSIS

16.16 Record out-of-limit telemetry.

____

16.17 Record variances of gimbal positions from soft stop positions.

____

17.0 TABLE

Conversion of Azimuth Angle (AZIM), Elevation Angle (ELEV), and Coarse Sun Sensor Voltage (CSSMAG) to Hexidecimal

Table 1. Hexidecimal conversions for CSSMAG, AZIM, and ELEV.

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
0	0	5.000	225.00	13.50
10	A	4.976	223.90	13.39
20	14	4.951	222.80	13.29
30	1E	4.927	221.70	13.18
40	28	4.902	220.60	13.07
50	32	4.878	219.51	12.96
60	3C	4.853	218.41	12.86
70	46	4.829	217.31	12.75
80	50	4.805	216.21	12.64
90	5A	4.780	215.11	12.53
100	64	4.756	214.01	12.43
110	6E	4.731	212.91	12.32
120	78	4.707	211.81	12.21
130	82	4.683	210.71	12.10
140	8C	4.658	209.62	12.00
150	96	4.634	208.52	11.89
160	A0	4.609	207.42	11.78
170	AA	4.585	206.32	11.67
180	B4	4.560	205.22	11.57
190	BE	4.536	204.12	11.46
200	C8	4.512	203.02	11.35
210	D2	4.487	201.92	11.24
220	DC	4.463	200.82	11.14
230	E6	4.438	199.73	11.03
240	F0	4.414	198.63	10.92
250	FA	4.389	197.53	10.81
260	104	4.365	196.43	10.71
270	10E	4.341	195.33	10.60
280	118	4.316	194.23	10.49
290	122	4.292	193.13	10.38
300	12C	4.267	192.03	10.28
310	136	4.243	190.93	10.17
320	140	4.219	189.84	10.06
330	14A	4.194	188.74	9.95
340	154	4.170	187.64	9.85
350	15E	4.145	186.54	9.74
360	168	4.121	185.44	9.63
370	172	4.096	184.34	9.52
380	17C	4.072	183.24	9.42
390	186	4.048	182.14	9.31
400	190	4.023	181.04	9.20
410	19A	3.999	179.95	9.09
420	1A4	3.974	178.85	8.99
430	1AE	3.950	177.75	8.88
440	1B8	3.926	176.65	8.77
450	1C2	3.901	175.55	8.66
460	1CC	3.877	174.45	8.56
470	1D6	3.852	173.35	8.45
480	1E0	3.828	172.25	8.34
490	1EA	3.803	171.15	8.24
500	1F4	3.779	170.05	8.13
510	1FE	3.755	168.96	8.02
520	208	3.730	167.86	7.91
530	212	3.706	166.76	7.81
540	21C	3.681	165.66	7.70
550	226	3.657	164.56	7.59
560	230	3.632	163.46	7.48
570	23A	3.608	162.36	7.38
580	244	3.584	161.26	7.27

Table 1, Continued

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
590	24E	3.559	160.16	7.16
600	258	3.535	159.07	7.05
610	262	3.510	157.97	6.95
620	26C	3.486	156.87	6.84
630	276	3.462	155.77	6.73
640	280	3.437	154.67	6.62
650	28A	3.413	153.57	6.52
660	294	3.388	152.47	6.41
670	29E	3.364	151.37	6.30
680	2A8	3.339	150.27	6.19
690	2B2	3.315	149.18	6.09
700	2BC	3.291	148.08	5.98
710	2C6	3.266	146.98	5.87
720	2D0	3.242	145.88	5.76
730	2DA	3.217	144.78	5.66
740	2E4	3.193	143.68	5.55
750	2EE	3.168	142.58	5.44
760	2F8	3.144	141.48	5.33
770	302	3.120	140.38	5.23
780	30C	3.095	139.29	5.12
790	316	3.071	138.19	5.01
800	320	3.046	137.09	4.90
810	32A	3.022	135.99	4.80
820	334	2.998	134.89	4.69
830	33E	2.973	133.79	4.58
840	348	2.949	132.69	4.47
850	352	2.924	131.59	4.37
860	35C	2.900	130.49	4.26
870	366	2.875	129.40	4.15
880	370	2.851	128.30	4.04
890	37A	2.827	127.20	3.94
900	384	2.802	126.10	3.83
910	38E	2.778	125.00	3.72
920	398	2.753	123.90	3.61
930	3A2	2.729	122.80	3.51
940	3AC	2.705	121.70	3.40
950	3B6	2.680	120.60	3.29
960	3C0	2.656	119.51	3.18
970	3CA	2.631	118.41	3.08
980	3D4	2.607	117.31	2.97
990	3DE	2.582	116.21	2.86
1000	3E8	2.558	115.11	2.76
1010	3F2	2.534	114.01	2.65
1020	3FC	2.509	112.91	2.54
1030	406	2.485	111.81	2.43
1040	410	2.460	110.71	2.33
1050	41A	2.436	109.62	2.22
1060	424	2.411	108.52	2.11
1070	42E	2.387	107.42	2.00
1080	438	2.363	106.32	1.90
1090	442	2.338	105.22	1.79
1100	44C	2.314	104.12	1.68
1110	456	2.289	103.02	1.57
1120	460	2.265	101.92	1.47
1130	46A	2.241	100.82	1.36
1140	474	2.216	99.73	1.25
1150	47E	2.192	98.63	1.14
1160	488	2.167	97.53	1.04
1170	492	2.143	96.43	0.93

Table 1, Continued

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
1180	49C	2.118	95.33	0.82
1190	4A6	2.094	94.23	0.71
1200	4B0	2.070	93.13	0.61
1210	4BA	2.045	92.03	0.50
1220	4C4	2.021	90.93	0.39
1230	4CE	1.996	89.84	0.28
1240	4D8	1.972	88.74	0.18
1250	4E2	1.947	87.64	0.07
1260	4EC	1.923	86.54	-0.04
1270	4F6	1.899	85.44	-0.15
1280	500	1.874	84.34	-0.25
1290	50A	1.850	83.24	-0.36
1300	514	1.825	82.14	-0.47
1310	51E	1.801	81.04	-0.58
1320	528	1.777	79.95	-0.68
1330	532	1.752	78.85	-0.79
1340	53C	1.728	77.75	-0.90
1350	546	1.703	76.65	-1.01
1360	550	1.679	75.55	-1.11
1370	55A	1.654	74.45	-1.22
1380	564	1.630	73.35	-1.33
1390	56E	1.606	72.25	-1.44
1400	578	1.581	71.15	-1.54
1410	582	1.557	70.05	-1.65
1420	58C	1.532	68.96	-1.76
1430	596	1.508	67.86	-1.87
1440	5A0	1.484	66.76	-1.97
1450	5AA	1.459	65.66	-2.08
1460	5B4	1.435	64.56	-2.19
1470	5BE	1.410	63.46	-2.29
1480	5C8	1.386	62.36	-2.40
1490	5D2	1.361	61.26	-2.51
1500	5DC	1.337	60.16	-2.62
1510	5E6	1.313	59.07	-2.72
1520	5F0	1.288	57.97	-2.83
1530	5FA	1.264	56.87	-2.94
1540	604	1.239	55.77	-3.05
1550	60E	1.215	54.67	-3.15
1560	618	1.190	53.57	-3.26
1570	622	1.166	52.47	-3.37
1580	62C	1.142	51.37	-3.48
1590	636	1.117	50.27	-3.58
1600	640	1.093	49.18	-3.69
1610	64A	1.068	48.08	-3.80
1620	654	1.044	46.98	-3.91
1630	65E	1.020	45.88	-4.01
1640	668	0.995	44.78	-4.12
1650	672	0.971	43.68	-4.23
1660	67C	0.946	42.58	-4.34
1670	686	0.922	41.48	-4.44
1680	690	0.897	40.38	-4.55
1690	69A	0.873	39.29	-4.66
1700	6A4	0.849	38.19	-4.77
1710	6AE	0.824	37.09	-4.87
1720	6B8	0.800	35.99	-4.98
1730	6C2	0.775	34.89	-5.09
1740	6CC	0.751	33.79	-5.20
1750	6D6	0.726	32.69	-5.30
1760	6E0	0.702	31.59	-5.41

Table 1, Continued

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
1770	6EA	0.678	30.49	-5.52
1780	6F4	0.653	29.40	-5.63
1790	6FE	0.629	28.30	-5.73
1800	708	0.604	27.20	-5.84
1810	712	0.580	26.10	-5.95
1820	71C	0.556	25.00	-6.06
1830	726	0.531	23.90	-6.16
1840	730	0.507	22.80	-6.27
1850	73A	0.482	21.70	-6.38
1860	744	0.458	20.60	-6.49
1870	74E	0.433	19.51	-6.59
1880	758	0.409	18.41	-6.70
1890	762	0.385	17.31	-6.81
1900	76C	0.360	16.21	-6.92
1910	776	0.336	15.11	-7.02
1920	780	0.311	14.01	-7.13
1930	78A	0.287	12.91	-7.24
1940	794	0.263	11.81	-7.34
1950	79E	0.238	10.71	-7.45
1960	7A8	0.214	9.62	-7.56
1970	7B2	0.189	8.52	-7.67
1980	7BC	0.165	7.42	-7.77
1990	7C6	0.140	6.32	-7.88
2000	7D0	0.116	5.22	-7.99
2010	7DA	0.092	4.12	-8.10
2020	7E4	0.067	3.02	-8.20
2030	7EE	0.043	1.92	-8.31
2040	7F8	0.018	0.82	-8.42
2050	802	-0.006	-0.27	-8.53
2060	80C	-0.031	-1.37	-8.63
2070	816	-0.055	-2.47	-8.74
2080	820	-0.079	-3.57	-8.85
2090	82A	-0.104	-4.67	-8.96
2100	834	-0.128	-5.77	-9.06
2110	83E	-0.153	-6.87	-9.17
2120	848	-0.177	-7.97	-9.28
2130	852	-0.201	-9.07	-9.39
2140	85C	-0.226	-10.16	-9.49
2150	866	-0.250	-11.26	-9.60
2160	870	-0.275	-12.36	-9.71
2170	87A	-0.299	-13.46	-9.82
2180	884	-0.324	-14.56	-9.92
2190	88E	-0.348	-15.66	-10.03
2200	898	-0.372	-16.76	-10.14
2210	8A2	-0.397	-17.86	-10.25
2220	8AC	-0.421	-18.96	-10.35
2230	8B6	-0.446	-20.05	-10.46
2240	8C0	-0.470	-21.15	-10.57
2250	8CA	-0.495	-22.25	-10.68
2260	8D4	-0.519	-23.35	-10.78
2270	8DE	-0.543	-24.45	-10.89
2280	8E8	-0.568	-25.55	-11.00
2290	8F2	-0.592	-26.65	-11.11
2300	8FC	-0.617	-27.75	-11.21
2310	906	-0.641	-28.85	-11.32
2320	910	-0.665	-29.95	-11.43
2330	91A	-0.690	-31.04	-11.54
2340	924	-0.714	-32.14	-11.64
2350	92E	-0.739	-33.24	-11.75

Table 1, Continued

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
2360	938	-0.763	-34.34	-11.86
2370	942	-0.788	-35.44	-11.97
2380	94C	-0.812	-36.54	-12.07
2390	956	-0.836	-37.64	-12.18
2400	960	-0.861	-38.74	-12.29
2410	96A	-0.885	-39.84	-12.39
2420	974	-0.910	-40.93	-12.50
2430	97E	-0.934	-42.03	-12.61
2440	988	-0.958	-43.13	-12.72
2450	992	-0.983	-44.23	-12.82
2460	99C	-1.007	-45.33	-12.93
2470	9A6	-1.032	-46.43	-13.04
2480	9B0	-1.056	-47.53	-13.15
2490	9BA	-1.081	-48.63	-13.25
2500	9C4	-1.105	-49.73	-13.36
2510	9CE	-1.129	-50.82	-13.47
2520	9D8	-1.154	-51.92	-13.58
2530	9E2	-1.178	-53.02	-13.68
2540	9EC	-1.203	-54.12	-13.79
2550	9F6	-1.227	-55.22	-13.90
2560	A00	-1.252	-56.32	-14.01
2570	A0A	-1.276	-57.42	-14.11
2580	A14	-1.300	-58.52	-14.22
2590	A1E	-1.325	-59.62	-14.33
2600	A28	-1.349	-60.71	-14.44
2610	A32	-1.374	-61.81	-14.54
2620	A3C	-1.398	-62.91	-14.65
2630	A46	-1.422	-64.01	-14.76
2640	A50	-1.447	-65.11	-14.87
2650	A5A	-1.471	-66.21	-14.97
2660	A64	-1.496	-67.31	-15.08
2670	A6E	-1.520	-68.41	-15.19
2680	A78	-1.545	-69.51	-15.30
2690	A82	-1.569	-70.60	-15.40
2700	A8C	-1.593	-71.70	-15.51
2710	A96	-1.618	-72.80	-15.62
2720	AA0	-1.642	-73.90	-15.73
2730	AAA	-1.667	-75.00	-15.83
2740	AB4	-1.691	-76.10	-15.94
2750	ABE	-1.716	-77.20	-16.05
2760	AC8	-1.740	-78.30	-16.16
2770	AD2	-1.764	-79.40	-16.26
2780	ADC	-1.789	-80.49	-16.37
2790	AE6	-1.813	-81.59	-16.48
2800	AF0	-1.838	-82.69	-16.59
2810	AFA	-1.862	-83.79	-16.69
2820	B04	-1.886	-84.89	-16.80
2830	B0E	-1.911	-85.99	-16.91
2840	B18	-1.935	-87.09	-17.02
2850	B22	-1.960	-88.19	-17.12
2860	B2C	-1.984	-89.29	-17.23
2870	B36	-2.009	-90.38	-17.34
2880	B40	-2.033	-91.48	-17.45
2890	B4A	-2.057	-92.58	-17.55
2900	B54	-2.082	-93.68	-17.66
2910	B5E	-2.106	-94.78	-17.77
2920	B68	-2.131	-95.88	-17.87
2930	B72	-2.155	-96.98	-17.98
2940	B7C	-2.179	-98.08	-18.09

Table 1, Continued

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
2950	B86	-2.204	-99.18	-18.20
2960	B90	-2.228	-100.27	-18.30
2970	B9A	-2.253	-101.37	-18.41
2980	BA4	-2.277	-102.47	-18.52
2990	BAE	-2.302	-103.57	-18.63
3000	BB8	-2.326	-104.67	-18.73
3010	BC2	-2.350	-105.77	-18.84
3020	BCC	-2.375	-106.87	-18.95
3030	BD6	-2.399	-107.97	-19.06
3040	BE0	-2.424	-109.07	-19.16
3050	BEA	-2.448	-110.16	-19.27
3060	BF4	-2.473	-111.26	-19.38
3070	BFE	-2.497	-112.36	-19.49
3080	C08	-2.521	-113.46	-19.59
3090	C12	-2.546	-114.56	-19.70
3100	C1C	-2.570	-115.66	-19.81
3110	C26	-2.595	-116.76	-19.92
3120	C30	-2.619	-117.86	-20.02
3130	C3A	-2.643	-118.96	-20.13
3140	C44	-2.668	-120.05	-20.24
3150	C4E	-2.692	-121.15	-20.35
3160	C58	-2.717	-122.25	-20.45
3170	C62	-2.741	-123.35	-20.56
3180	C6C	-2.766	-124.45	-20.67
3190	C76	-2.790	-125.55	-20.78
3200	C80	-2.814	-126.65	-20.88
3210	C8A	-2.839	-127.75	-20.99
3220	C94	-2.863	-128.85	-21.10
3230	C9E	-2.888	-129.95	-21.21
3240	CA8	-2.912	-131.04	-21.31
3250	CB2	-2.937	-132.14	-21.42
3260	CBC	-2.961	-133.24	-21.53
3270	CC6	-2.985	-134.34	-21.64
3280	CD0	-3.010	-135.44	-21.74
3290	CDA	-3.034	-136.54	-21.85
3300	CE4	-3.059	-137.64	-21.96
3310	CEE	-3.083	-138.74	-22.07
3320	CF8	-3.107	-139.84	-22.17
3330	D02	-3.132	-140.93	-22.28
3340	D0C	-3.156	-142.03	-22.39
3350	D16	-3.181	-143.13	-22.50
3360	D20	-3.205	-144.23	-22.60
3370	D2A	-3.230	-145.33	-22.71
3380	D34	-3.254	-146.43	-22.82
3390	D3E	-3.278	-147.53	-22.92
3400	D48	-3.303	-148.63	-23.03
3410	D52	-3.327	-149.73	-23.14
3420	D5C	-3.352	-150.82	-23.25
3430	D66	-3.376	-151.92	-23.35
3440	D70	-3.400	-153.02	-23.46
3450	D7A	-3.425	-154.12	-23.57
3460	D84	-3.449	-155.22	-23.68
3470	D8E	-3.474	-156.32	-23.78
3480	D98	-3.498	-157.42	-23.89
3490	DA2	-3.523	-158.52	-24.00
3500	DAC	-3.547	-159.62	-24.11
3510	DB6	-3.571	-160.71	-24.21
3520	DC0	-3.596	-161.81	-24.32
3530	DCA	-3.620	-162.91	-24.43

Table 1, Continued

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OF POOR QUALITY

BIT COUNT	HEX EQUIV.	VOLTAGE	AZ ANGLE	EL ANGLE
3540	DD4	-3.645	-164.01	-24.54
3550	DDE	-3.669	-165.11	-24.64
3560	DE8	-3.694	-166.21	-24.75
3570	DF2	-3.718	-167.31	-24.86
3580	DFC	-3.742	-168.41	-24.97
3590	E06	-3.767	-169.51	-25.07
3600	E10	-3.791	-170.60	-25.18
3610	E1A	-3.816	-171.70	-25.29
3620	E24	-3.840	-172.80	-25.40
3630	E2E	-3.864	-173.90	-25.50
3640	E38	-3.889	-175.00	-25.61
3650	E42	-3.913	-176.10	-25.72
3660	E4C	-3.938	-177.20	-25.83
3670	E56	-3.962	-178.30	-25.93
3680	E60	-3.987	-179.40	-26.04
3690	E6A	-4.011	-180.49	-26.15
3700	E74	-4.035	-181.59	-26.26
3710	E7E	-4.060	-182.69	-26.36
3720	E88	-4.084	-183.79	-26.47
3730	E92	-4.109	-184.89	-26.58
3740	E9C	-4.133	-185.99	-26.69
3750	EA6	-4.158	-187.09	-26.79
3760	EB0	-4.182	-188.19	-26.90
3770	EBA	-4.206	-189.29	-27.01
3780	EC4	-4.231	-190.38	-27.12
3790	ECE	-4.255	-191.48	-27.22
3800	ED8	-4.280	-192.58	-27.33
3810	EE2	-4.304	-193.68	-27.44
3820	EEC	-4.328	-194.78	-27.55
3830	EF6	-4.353	-195.88	-27.65
3840	F00	-4.377	-196.98	-27.76
3850	F0A	-4.402	-198.08	-27.87
3860	F14	-4.426	-199.18	-27.97
3870	F1E	-4.451	-200.27	-28.08
3880	F28	-4.475	-201.37	-28.19
3890	F32	-4.499	-202.47	-28.30
3900	F3C	-4.524	-203.57	-28.40
3910	F46	-4.548	-204.67	-28.51
3920	F50	-4.573	-205.77	-28.62
3930	F5A	-4.597	-206.87	-28.73
3940	F64	-4.621	-207.97	-28.83
3950	F6E	-4.646	-209.07	-28.94
3960	F78	-4.670	-210.16	-29.05
3970	F82	-4.695	-211.26	-29.16
3980	F8C	-4.719	-212.36	-29.26
3990	F96	-4.744	-213.46	-29.37
4000	FA0	-4.768	-214.56	-29.48
4010	FAA	-4.792	-215.66	-29.59
4020	FB4	-4.817	-216.76	-29.69
4030	FBE	-4.841	-217.86	-29.80
4040	FC8	-4.866	-218.96	-29.91
4050	FD2	-4.890	-220.05	-30.02
4060	FDC	-4.915	-221.15	-30.12
4070	FE6	-4.939	-222.25	-30.23
4080	FF0	-4.963	-223.35	-30.34
4090	FFA	-4.988	-224.45	-30.45

18.0 APPENDIX 1

CONFIGURATION OF THE HALOE INSTRUMENT

General: This description is based on a complete flight instrument and only the deviations from this configuration are noted.

Telescope:
- Door pin puller is not installed.

Main Frame:
- G.C. detectors (InAs and HgCdTe) are test detectors.
- Gas Cells (correlation and calibration) are test gas cells.
- Spectral filters are test filters.
- Calibration neutral density filters are test filters (port #4 and #7 filters changed).
- Blackbody is EOI original design.

BGA: Installed. Pin pullers Az and El gimbal pin pullers not installed.

Adaptor: Installed.

Sun Sensor:
- Installed (with neutral density filter in place).
- Fasteners are potted.

Covers: Installed.

MLI: Not installed.

Electronics:

Gimbal Electronics Assembly:

G1 Slice
- SIT resistors on posts.
- Not conformally coated

G2 Slice
- SIT resistors on posts.
- Not conformally coated.

G3 Slice
- DAC's not flight (4).
- AD2701 may be replaced @ refurbishment
- Not conformally coated.

G4 Slice
- Not conformally coated.
- TECC bridge value set to match test detector; may change when flight detectors are installed

Platform Electronics Assembly:

P1 Slice
- Not conformally coated.
- Not flight.

P2 Slice - Not conformally coated.
- EPROMs are installed.
- Microprocessor and memory chips are in sockets (not soldered to sockets)
- Not flight.

P3 Slice - Not conformally coated.
- Not flight.

P4 Slice - In flight configuration.

Sun Sensor Electronics:

CSS Board - Not conformally coated.
- SIT resistors on posts.

FSS Board - Conformally coated.
- Needs troubleshooting for source of noise.

Detector Preamplifiers:

Radiometer Preamps - Does not have flight gains.
- Conformally coated.

GC Preamps - 1K pots will be installed for flight.
- Conformally coated.
- Does not have flight gains.
- HF preamp is not flight.

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16. Abstract

The Performance Verification Test Procedure is given for the Halogen Occultation Experiment (HALOE) instrument, which is being developed in house at the Langley Research Center for the Upper Atmosphere Research Satellite (UARS). This procedure is used for comprehensive performance testing of the HALOE instrument which occurs before, during, and after flight environmental tests. The radiometric performance tests include noise, drift, linearity, instantaneous field-of-view, cal wheel gas cell characterization, and self thermal emissions. Pointer/tracker performance tests include sun sensor performance, gimbal performance, control system performance, and boresight alignment. In addition, the instrument is tested functionally in simulated orbit sequences and all command operating modes are exercised. The data analysis required for each test is specified and pass/fail criteria are given where applicable. This test will fully demonstrate the HALOE instrument's ability to achieve science mission requirements. The HALOE instrument is a gas correlation radiometer that measures vertical distribution of eight upper atmospheric constituents: O_3, HCl, HF, NO, CH_4, H_2O, NO_2, and CO_2.

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